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March 2010

Draft
Environmental Impact Report

Volume 3 of 3
Appendices H through M

For the
San Francisco Public Utilities Commission's

LOWER CRYSTAL SPRINGS DAM IMPROVEMENTS PROJECT

San Francisco Planning Department Case No. 2006.0536E
State Clearinghouse No. 2007012002

Draft EIR Publication Date: March 2, 2010
Public Hearing Date: April 6, 2010, Hillsborough
Public Hearing Date: April 8, 2010, San Francisco
Public Comment Period: March 2, 2010 to April 16, 2010

City and County of San Francisco
San Francisco Planning Department

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City and County of San Francisco
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Wetland Determination Report

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site: Crystal Springs
Date: 09/05/06
Applicant/Owner: SFPUC
County: San Mateo
Investigator: K. Colgate, S. Ebrahim
State: California
Do Normal Circumstances exist on the site? ☒Yes ☐No
Community ID:
Is the site significantly disturbed (Atypical Situation)? ☐Yes ☒No
Plot ID: WET097
Is the area a potential Problem Area? ☐Yes ☒No
Transect ID: 1-C
(If needed, explain on reverse side.)

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. *Oenanthe sarmentosa*	90	H	OBL
2. *Helenium bigelovii*	10	H	OBL
3. *Rubus ursinus*	100	S	NL
4. *Salix lasiolepis*	100	T	FACW
5.			
6.			
7			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 75

Remarks:

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
☐ Stream, Lake, or Tide Gauge
☒ Aerial Photographs
☐ Other
☐ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water: N/A (in.)
Depth to Free Water in Pit: >12 (in.)
Depth to Saturated Soil >12 (in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:
☐ Inundated
☐ Saturated in upper 12 inches
☐ Water Marks
☐ Drift Lines
☐ Sediment Deposits
☒ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
☐ Oxidized root channels in upper 12 inches
☐ Water-stained Leaves
☐ Local Soil Survey Data
☐ FAC-Neutral Test
☐ Other (explain in Remarks)

Remarks:

SOILS

Map Unit Name
(Series and Phase) ________________.
Drainage Class: ________________.
Field Observations
Confirm Mapped Type? Yes No

Taxonomy (Subgroup): ________________

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
8"		5 YR 2.5/1			

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
X Aquic Moisture Regime
___ Reducing Conditions
X Gleyed or Low-Chroma Colors

___ Concretions
___ High Organic Content in Surface Layer in Sandy Soils
___ Organic Streaking in Sandy Soils
___ Listed on Local Hydric Soils List
___ Listed on National Hydric Soils List
___ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

(Circle)
Hydrophytic Vegetation Present? [✓ Yes] No
Wetland Hydrology Present? [✓ Yes] No
Hydric Soils Present? [✓ Yes] No

(Circle)
Is this Sampling Point Within a Wetland? [✓ Yes] No

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site:	Crystal Springs	Date:	09/06/06
Applicant/Owner:	SFPUC	County:	San Mateo
Investigator:	K. Colgate, S. Ebrahim	State:	California
Do Normal Circumstances exist on the site?	☒Yes ☐No	Community ID:	
Is the site significantly disturbed (Atypical Situation)?	☐Yes ☒No	Plot ID:	WET97
Is the area a potential Problem Area? (If needed, explain on reverse side.)	☐Yes ☒No	Transect ID:	02 A

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. *Phyla nodiflora*	30	H	FACW
2. *Avena fatua*	20	H	NL
3. *Lolium multiflorum*	30	H	NL
4. *Cyperus eragrostis*	20	H	FACW
5.			
6.			
7.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 50 %

Remarks:

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
☐ Stream, Lake, or Tide Gauge
☐ Aerial Photographs
☐ Other
☐ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water: N/A (in.)

Depth to Free Water in Pit: -- (in.)

Depth to Saturated Soil -- (in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:

☐ Inundated
☐ Saturated in upper 12 inches
☐ Water Marks
☐ Drift Lines
☐ Sediment Deposits
☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):

☐ Oxidized root channels in upper 12 inches
☐ Water-stained Leaves
☐ Local Soil Survey Data
☐ FAC-Neutral Test
☐ Other (explain in Remarks)

Remarks:

SOILS

Map Unit Name
(Series and Phase) ____________________.

Drainage Class: ____________________.

Taxonomy (Subgroup): ____________________

Field Observations
Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.

Hydric Soil Indicators:

- ____ Histosol
- ____ Histic Epipedon
- ____ Sulfidic Odor
- ____ Aquic Moisture Regime
- ____ Reducing Conditions
- ____ Gleyed or Low-Chroma Colors
- ____ Concretions
- ____ High Organic Content in Surface Layer in Sandy Soils
- ____ Organic Streaking in Sandy Soils
- ____ Listed on Local Hydric Soils List
- ____ Listed on National Hydric Soils List
- ____ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

	(Circle)
Hydrophytic Vegetation Present?	Yes [✓ No]
Wetland Hydrology Present?	Yes No
Hydric Soils Present?	Yes No

	(Circle)
Is this Sampling Point Within a Wetland?	Yes [✓ No]

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site:	Crystal Springs	Date:	09/06/06
Applicant/Owner:	SFPUC	County:	San Mateo
Investigator:	K. Colgate, S. Ebrahim	State:	California
Do Normal Circumstances exist on the site?	☒Yes ☐No	Community ID:	
Is the site significantly disturbed (Atypical Situation)?	☐Yes ☒No	Plot ID:	WET97
Is the area a potential Problem Area? (If needed, explain on reverse side.)	☐Yes ☒No	Transect ID:	02-B

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. *Phyla nodiflora*	50	H	FACW
2. *Mentha pulegium*	20	H	OBL
3. *Lolium multiflorum*	15	H	NL
4. *Cyperus eragrostis*	10	H	FACW
5.			
6.			
7.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 75%

Remarks:

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
☐ Stream, Lake, or Tide Gauge
☒ Aerial Photographs
☐ Other
☐ No Recorded Data Available

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:

☐ Inundated
☐ Saturated in upper 12 inches
☐ Water Marks
☒ Drift Lines
☐ Sediment Deposits
☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):

☐ Oxidized root channels in upper 12 inches
☐ Water-stained Leaves
☐ Local Soil Survey Data
☐ FAC-Neutral Test
☐ Other (explain in Remarks)

FIELD OBSERVATIONS:

Depth of Surface Water:	N/A	(in.)
Depth to Free Water in Pit:	>16	(in.)
Depth to Saturated Soil	>16	(in.)

Remarks: Algal mat

SOILS

Map Unit Name
(Series and Phase) ______________________________.
Taxonomy (Subgroup): ______________________________

Drainage Class: ____________________.
Field Observations
Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
8"	10 YR 2/1	5 YR 4/6 and 2.5 YR 3/6			Mottles; mod. Abune, loamy with silt

Hydric Soil Indicators:

____ Histosol
____ Histic Epipedon
____ Sulfidic Odor
____ Aquic Moisture Regime
____ Reducing Conditions
__X__ Gleyed or Low-Chroma Colors

____ Concretions
____ High Organic Content in Surface Layer in Sandy Soils
____ Organic Streaking in Sandy Soils
____ Listed on Local Hydric Soils List
____ Listed on National Hydric Soils List
____ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

(Circle)
Hydrophytic Vegetation Present? [✓ Yes] No
Wetland Hydrology Present? [✓ Yes] No
Hydric Soils Present? [✓ Yes] No

(Circle)
Is this Sampling Point Within a Wetland? [✓ Yes] No

Remarks:

WET097_TR3_PitA

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site:	Crystal Springs	Date:	09/06/06
Applicant/Owner:	SFPUC	County:	San Mateo
Investigator:	K. Colgate, S. Ebrahim	State:	California

Do Normal Circumstances exist on the site? ☒Yes ☐No — Community ID:

Is the site significantly disturbed (Atypical Situation)? ☐Yes ☒No — Plot ID: WET97

Is the area a potential Problem Area? ☐Yes ☒No — Transect ID: 03-A

(If needed, explain on reverse side.)

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. *Phyla nodiflora*	30	H	FACW
2. *Lolium multiflorum*	60	H	NL
3.			
4.			
5.			
6.			
7.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 50%

Remarks: <2% cover by *Cyperus eragrostis* and *Rumex crispus* directly adjacent

HYDROLOGY

- ☐ Recorded Data (Describe in Remarks):
- ☐ Stream, Lake, or Tide Gauge
- ☐ Aerial Photographs
- ☐ Other
- ☐ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water: ______ (in.)

Depth to Free Water in Pit: ______ (in.)

Depth to Saturated Soil ______ (in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:

- ☐ Inundated
- ☐ Saturated in upper 12 inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):

- ☐ Oxidized root channels in upper 12 inches
- ☐ Water-stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (explain in Remarks)

Remarks: Below the OHWL

WET097_TR3_PitA

SOILS

Map Unit Name
(Series and Phase) ______________________________.

Taxonomy (Subgroup): ______________________________

Drainage Class: ______________.
Field Observations
Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
	10 YR 2/1	5 YR 4/6 and 2.5 YR 3/6			Mottles

Hydric Soil Indicators:

- ___ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- ___ Aquic Moisture Regime
- ___ Reducing Conditions
- ___ Gleyed or Low-Chroma Colors
- ___ Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- ___ Listed on Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- ___ Other (Explain in Remarks)

Remarks: Based on observations made during the field verification on October 18, 2007 and the circumstance that *Lolium multiflorum* is often found in jurisdictional areas, the jurisdictional boundary was adjusted upward to the OHWL in this area.

WETLAND DETERMINATION

	(Circle)	
Hydrophytic Vegetation Present?	[✓ Yes]	No
Wetland Hydrology Present?	[✓ Yes]	No
Hydric Soils Present?	[✓ Yes]	No

(Circle)
Is this Sampling Point Within a Wetland? [✓ Yes] No

Remarks:

Based on observations made

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 CoE WETLANDS DELINEATION MANUAL)

Project/Site: Crystal Springs
Date: 09/06/06
Applicant/Owner: SFPUC
County: San Mateo
Investigator: K. Colgate, S. Ebrahim
State: California
Do Normal Circumstances exist on the site? ☒Yes ☐No
Community ID:
Is the site significantly disturbed (Atypical Situation)? ☐Yes ☒No
Plot ID: WET97
Is the area a potential Problem Area? ☐Yes ☒No
Transect ID: 03-B
(If needed, explain on reverse side.)

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. *Phyla nodiflora*	45	H	FACW
2. Unknown grass	10	H	?
3. *Lolium multiflorum*	15	H	NL
4. *Mentha puligium*	20	H	OBL
5. *Rumex crispus*	10	H	FACW-
6.			
7.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): At least 60%

Remarks:

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
☐ Stream, Lake, or Tide Gauge
☒ Aerial Photographs
☐ Other
☐ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water: n/a (in.)

Depth to Free Water in Pit: -- (in.)

Depth to Saturated Soil -- (in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:
☐ Inundated
☐ Saturated in upper 12 inches
☐ Water Marks
☒ Drift Lines
☐ Sediment Deposits
☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
☐ Oxidized root channels in upper 12 inches
☐ Water-stained Leaves
☐ Local Soil Survey Data
☐ FAC-Neutral Test
☐ Other (explain in Remarks)

Remarks: Algal mat

SOILS

Map Unit Name
(Series and Phase) ______________________________.

Drainage Class: ______________________.
Field Observations
Confirm Mapped Type? Yes No

Taxonomy (Subgroup): ______________________________

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
	10 YR 2/1	5 YR 4/6 and 2.5 YR 3/6			Mottles

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
___ Aquic Moisture Regime
___ Reducing Conditions
_X_ Gleyed or Low-Chroma Colors

___ Concretions
___ High Organic Content in Surface Layer in Sandy Soils
___ Organic Streaking in Sandy Soils
___ Listed on Local Hydric Soils List
___ Listed on National Hydric Soils List
___ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

(Circle)
Hydrophytic Vegetation Present? [✓ Yes] No
Wetland Hydrology Present? [✓ Yes] No
Hydric Soils Present? [✓ Yes] No

(Circle)
Is this Sampling Point Within a Wetland? [✓ Yes] No

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site:	Crystal Springs	Date:	09/06/06
Applicant/Owner:	SFPUC	County:	San Mateo
Investigator:	K. Colgate, S. Ebrahim	State:	California

Do Normal Circumstances exist on the site? ☒Yes ☐No — Community ID:

Is the site significantly disturbed (Atypical Situation)? ☐Yes ☒No — Plot ID: WET100

Is the area a potential Problem Area? ☐Yes ☒No — Transect ID: 1-A
(If needed, explain on reverse side.)

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. *Baccharis pilularis*		S	NL
2. *Toxicodendron diversilobum*		S	NL
3. *Quercus agrifolia*		T	NL
4.			
5.			
6.			
7			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 0

Remarks:

HYDROLOGY

- ☐ Recorded Data (Describe in Remarks):
- ☐ Stream, Lake, or Tide Gauge
- ☐ Aerial Photographs
- ☐ Other
- ☐ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water: N/A (in.)

Depth to Free Water in Pit: -- (in.)

Depth to Saturated Soil -- (in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:
- ☐ Inundated
- ☐ Saturated in upper 12 inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ☐ Oxidized root channels in upper 12 inches
- ☐ Water-stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (explain in Remarks)

Remarks:

SOILS

Map Unit Name
(Series and Phase) ____________________.
Taxonomy (Subgroup): ____________________

Drainage Class: ____________________.
Field Observations
Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.

Hydric Soil Indicators:

- ____ Histosol
- ____ Histic Epipedon
- ____ Sulfidic Odor
- ____ Aquic Moisture Regime
- ____ Reducing Conditions
- ____ Gleyed or Low-Chroma Colors
- ____ Concretions
- ____ High Organic Content in Surface Layer in Sandy Soils
- ____ Organic Streaking in Sandy Soils
- ____ Listed on Local Hydric Soils List
- ____ Listed on National Hydric Soils List
- ____ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

	(Circle)	
Hydrophytic Vegetation Present?	Yes	[✓ No]
Wetland Hydrology Present?	Yes	No
Hydric Soils Present?	Yes	No

(Circle)
Is this Sampling Point Within a Wetland? Yes [✓ No]

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site:	Crystal Springs	Date:	09/06/06
Applicant/Owner:	SFPUC	County:	San Mateo
Investigator:	K. Colgate, S. Ebrahim	State:	California

Do Normal Circumstances exist on the site? ☒Yes ☐No — Community ID:

Is the site significantly disturbed (Atypical Situation)? ☐Yes ☒No — Plot ID: WET100

Is the area a potential Problem Area? ☐Yes ☒No — Transect ID: 1
(If needed, explain on reverse side.) B

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. Paspalum distichum	90	H	OBL
2. Eleocharis montevidensis	10	H	FACW
3.			
4.			
5.			
6.			
7			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100

Remarks:

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
☐ Stream, Lake, or Tide Gauge
☒ Aerial Photographs
☐ Other
☐ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water:	N/A	(in.)
Depth to Free Water in Pit:	>12	(in.)
Depth to Saturated Soil	>12	(in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:
☐ Inundated
☐ Saturated in upper 12 inches
☐ Water Marks
☒ Drift Lines
☐ Sediment Deposits
☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
☐ Oxidized root channels in upper 12 inches
☐ Water-stained Leaves
☐ Local Soil Survey Data
☐ FAC-Neutral Test
☐ Other (explain in Remarks)

Remarks:

SOILS

Map Unit Name
(Series and Phase) ______________________.
Drainage Class: ______________.
Field Observations
Confirm Mapped Type? Yes No

Taxonomy (Subgroup): ______________________

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.

Hydric Soil Indicators:

___	Histosol	___	Concretions
___	Histic Epipedon	___	High Organic Content in Surface Layer in Sandy Soils
___	Sulfidic Odor	___	Organic Streaking in Sandy Soils
___	Aquic Moisture Regime	___	Listed on Local Hydric Soils List
___	Reducing Conditions	___	Listed on National Hydric Soils List
___	Gleyed or Low-Chroma Colors	X	Other (Explain in Remarks)

Remarks:

WETLAND SOIL ASSUMED – GREATER THAN 90% COVER BY OBL

WETLAND DETERMINATION

	(Circle)		
Hydrophytic Vegetation Present?	[✓ Yes] No		(Circle)
Wetland Hydrology Present?	[✓ Yes] No		
Hydric Soils Present?	[✓ Yes] No	Is this Sampling Point Within a Wetland?	[✓ Yes] No

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site:	Crystal Springs			Date:	07/28/06
Applicant/Owner:	SFPUC			County:	San Mateo
Investigator:	K. Colgate, S. Ebrahim			State:	California
Do Normal Circumstances exist on the site?		☒Yes	☐No	Community ID:	
Is the site significantly disturbed (Atypical Situation)?		☐Yes	☒No	Plot ID:	WET100
Is the area a potential Problem Area? (If needed, explain on reverse side.)		☐Yes	☒No	Transect ID:	02 A

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. *Baccharis pilularis*	70	S	NL
2. *Toxicodendron diversilobum*	15	S	NL
3. *Heteromeles arbutifolia*	15	S	NL
4. *Quercus agrifolia*	100	T	NL
5.			
6.			
7.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 0 %

Remarks:

HYDROLOGY

- ☐ Recorded Data (Describe in Remarks):
- ☐ Stream, Lake, or Tide Gauge
- ☐ Aerial Photographs
- ☐ Other
- ☐ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water:	N/A	(in.)
Depth to Free Water in Pit:	--	(in.)
Depth to Saturated Soil	--	(in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:

- ☐ Inundated
- ☐ Saturated in upper 12 inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):

- ☐ Oxidized root channels in upper 12 inches
- ☐ Water-stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (explain in Remarks)

Remarks: No pit- veg not wetland

SOILS

Map Unit Name
(Series and Phase) ______. Drainage Class: ______.
Field Observations
Taxonomy (Subgroup): ______ Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
___ Aquic Moisture Regime
___ Reducing Conditions
___ Gleyed or Low-Chroma Colors
___ Concretions
___ High Organic Content in Surface Layer in Sandy Soils
___ Organic Streaking in Sandy Soils
___ Listed on Local Hydric Soils List
___ Listed on National Hydric Soils List
___ Other (Explain in Remarks)

Remarks:no pit veg not wetland

WETLAND DETERMINATION

	(Circle)	
Hydrophytic Vegetation Present?	Yes	[✓ No]
Wetland Hydrology Present?	Yes	No
Hydric Soils Present?	Yes	No

(Circle)
Is this Sampling Point Within a Wetland? Yes [✓ No]

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site:	Crystal Springs	Date:	07/30/06
Applicant/Owner:	SFPUC	County:	San Mateo
Investigator:	K. Colgate, S. Ebrahim	State:	California
Do Normal Circumstances exist on the site?	☒Yes ☐No	Community ID:	
Is the site significantly disturbed (Atypical Situation)?	☐Yes ☒No	Plot ID:	WET100
Is the area a potential Problem Area? (If needed, explain on reverse side.)	☐Yes ☒No	Transect ID:	02 B

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. *Leymus triticoides*	50	H	FAC+
2. *Phyla nodiflora*	30	H	FACW
3. *Cyperus eragrostis*	10	H	FACW
4. *Rumex crispus*	10	H	FACW-
5.			
6.			
7.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100%

Remarks:

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
☐ Stream, Lake, or Tide Gauge
☒ Aerial Photographs
☐ Other
☐ No Recorded Data Available

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:
☐ Inundated
☐ Saturated in upper 12 inches
☐ Water Marks
☒ Drift Lines
☒ Sediment Deposits
☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
☐ Oxidized root channels in upper 12 inches
☐ Water-stained Leaves
☐ Local Soil Survey Data
☐ FAC-Neutral Test
☐ Other (explain in Remarks)

FIELD OBSERVATIONS:

Depth of Surface Water:	N/A	(in.)
Depth to Free Water in Pit:	--	(in.)
Depth to Saturated Soil	--	(in.)

Remarks:

SOILS

Map Unit Name
(Series and Phase) ______________________.

Taxonomy (Subgroup): ______________________

Drainage Class: ______________.
Field Observations
Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-6		10 YR 2/2	5 YR 4/6	HIGH	SILTY- SOME GRAVEL
6-16*		10 YR 2/1	5 YR 4/6	LOW	SILTY- SOME GRAVEL

Hydric Soil Indicators:

☐ Histosol
☐ Histic Epipedon
☐ Sulfidic Odor
☐ Aquic Moisture Regime
☐ Reducing Conditions
☑ Gleyed or Low-Chroma Colors

☐ Concretions
☐ High Organic Content in Surface Layer in Sandy Soils
☐ Organic Streaking in Sandy Soils
☐ Listed on Local Hydric Soils List
☐ Listed on National Hydric Soils List
☐ Other (Explain in Remarks)

Remarks: *TOOK SOIL COLOR @ 8"

WETLAND DETERMINATION

(Circle)
Hydrophytic Vegetation Present? [✓ Yes] No
Wetland Hydrology Present? [✓ Yes] No
Hydric Soils Present? [✓ Yes] No

(Circle)
Is this Sampling Point Within a Wetland? [✓ Yes] No

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 CoE WETLANDS DELINEATION MANUAL)

Project/Site: Crystal Springs

Date: 07/28/06

Applicant/Owner: SFPUC

County: San Mateo

Investigator: K. Colgate, S. Ebrahim

State: California

Do Normal Circumstances exist on the site? ☒Yes ☐No

Community ID:

Is the site significantly disturbed (Atypical Situation)? ☐Yes ☒No

Plot ID: WET100

Is the area a potential Problem Area? ☐Yes ☒No
(If needed, explain on reverse side.)

Transect ID: 03-A

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. *Toxicodendron diversilobum*	80	S	NL
2. *Salix lasiolepis.*	100	T	FACW
3.			
4.			
5.			
6.			
7.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 50%

Remarks: *Toxicodendron diversilobum* extensive in the understory

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
☐ Stream, Lake, or Tide Gauge
☐ Aerial Photographs
☐ Other
☐ No Recorded Data Available

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:
☐ Inundated
☐ Saturated in upper 12 inches
☐ Water Marks
☐ Drift Lines
☐ Sediment Deposits
☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
☐ Oxidized root channels in upper 12 inches
☐ Water-stained Leaves
☐ Local Soil Survey Data
☐ FAC-Neutral Test
☐ Other (explain in Remarks)

FIELD OBSERVATIONS:

Depth of Surface Water: N/A (in.)

Depth to Free Water in Pit: -- (in.)

Depth to Saturated Soil -- (in.)

Remarks:

SOILS

Map Unit Name
(Series and Phase) ______________________________. Drainage Class: ______________.
Field Observations
Taxonomy (Subgroup): ______________________________ Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.

Hydric Soil Indicators:

- ___ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- ___ Aquic Moisture Regime
- ___ Reducing Conditions
- ___ Gleyed or Low-Chroma Colors
- ___ Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- ___ Listed on Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- ___ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

(Circle)
Hydrophytic Vegetation Present? Yes [✓ No]
Wetland Hydrology Present? Yes No
Hydric Soils Present? Yes No

(Circle)
Is this Sampling Point Within a Wetland? Yes [✓ No]

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 CoE WETLANDS DELINEATION MANUAL)

Project/Site:	Crystal Springs	Date:	07/28/06
Applicant/Owner:	SFPUC	County:	San Mateo
Investigator:	K. Colgate, S. Ebrahim	State:	California
Do Normal Circumstances exist on the site?	☒Yes ☐No	Community ID:	
Is the site significantly disturbed (Atypical Situation)?	☐Yes ☒No	Plot ID:	WET100
Is the area a potential Problem Area? (If needed, explain on reverse side.)	☐Yes ☒No	Transect ID:	03 B

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. *Rubus ursinus*	100	S	NL
2. *Salix lasiolepis*	100	T	FACW
3.			
4.			
5.			
6.			
7.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 50%*

Remarks: 1% Toxicodendron diversilobum
**Salix lasiolepis* much more dominant than *Rubus* spp. – considering wetland vegetation criteria met

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
☐ Stream, Lake, or Tide Gauge
☒ Aerial Photographs
☐ Other
☐ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water: NA (in.)

Depth to Free Water in Pit: >16 (in.)

Depth to Saturated Soil >16 (in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:
☐ Inundated
☐ Saturated in upper 12 inches
☐ Water Marks
☒ Drift Lines
☒ Sediment Deposits
☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
☐ Oxidized root channels in upper 12 inches
☐ Water-stained Leaves
☐ Local Soil Survey Data
☐ FAC-Neutral Test
☐ Other (explain in Remarks)

Remarks:

SOILS

Map Unit Name
(Series and Phase) ______________________. Drainage Class: ______________.
Field Observations
Taxonomy (Subgroup): ______________________ Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-6		10YR2/2			LOAM
6-16		10YR2/1			LOAM

Hydric Soil Indicators:

- ___ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- ___ Aquic Moisture Regime
- ___ Reducing Conditions
- ☑ Gleyed or Low-Chroma Colors
- ___ Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- ___ Listed on Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- ___ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

(Circle)
Hydrophytic Vegetation Present? [✓ Yes] No
Wetland Hydrology Present? [✓ Yes] No
Hydric Soils Present? [✓ Yes] No

(Circle)
Is this Sampling Point Within a Wetland? [✓ Yes] No

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 CoE WETLANDS DELINEATION MANUAL)

Project/Site:	Crystal Springs	Date:	07/28/06
Applicant/Owner:	SFPUC	County:	San Mateo
Investigator:	K. Colgate, S. Ebrahim	State:	California

Do Normal Circumstances exist on the site? ☒Yes ☐No — Community ID:

Is the site significantly disturbed (Atypical Situation)? ☐Yes ☒No — Plot ID: WET100

Is the area a potential Problem Area? ☐Yes ☒No — Transect ID: 04 A

(If needed, explain on reverse side.)

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. *Rubus ursinus.*		S	NL
2. *Toxicodendron diversilobum*		S	NL
3. *Baccharis pilularis*		S	NL
4. *Rhamnus californicus*		S	NL
5. *Quercus agrifolia*		T	NL
6.			
7.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): ≤ 20%

Remarks:

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
☐ Stream, Lake, or Tide Gauge
☐ Aerial Photographs
☐ Other
☐ No Recorded Data Available

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:
☐ Inundated
☐ Saturated in upper 12 inches
☐ Water Marks
☐ Drift Lines
☐ Sediment Deposits
☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
☐ Oxidized root channels in upper 12 inches
☐ Water-stained Leaves
☐ Local Soil Survey Data
☐ FAC-Neutral Test
☐ Other (explain in Remarks)

FIELD OBSERVATIONS:

Depth of Surface Water: __NA___(in.)

Depth to Free Water in Pit: *______ (in.)

Depth to Saturated Soil *______ (in.)

Remarks: Above drift line
* >16 - lower elevation pit dry

SOILS

Map Unit Name
(Series and Phase) ____.
Taxonomy (Subgroup): ________________________________

Drainage Class: ____________________.
Field Observations
Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
___ Aquic Moisture Regime
___ Reducing Conditions
___ Gleyed or Low-Chroma Colors

___ Concretions
___ High Organic Content in Surface Layer in Sandy Soils
___ Organic Streaking in Sandy Soils
___ Listed on Local Hydric Soils List
___ Listed on National Hydric Soils List
___ Other (Explain in Remarks)

Remarks:
No wetland vegetation- did not check soil

WETLAND DETERMINATION

(Circle)
Hydrophytic Vegetation Present? Yes [✓ No]
Wetland Hydrology Present? Yes [✓ No]
Hydric Soils Present? Yes No

(Circle)
Is this Sampling Point Within a Wetland? Yes [✓ No]

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site: Crystal Springs
Date: 07/28/06
Applicant/Owner: SFPUC
County: San Mateo
Investigator: K. Colgate, S. Ebrahim
State: California
Do Normal Circumstances exist on the site? ☒Yes ☐No
Community ID:
Is the site significantly disturbed (Atypical Situation)? ☐Yes ☒No
Plot ID: WET100
Is the area a potential Problem Area? ☐Yes ☒No
Transect ID: 04 B
(If needed, explain on reverse side.)

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. *Phyla nodiflora*	35	H	FACW
2. *Lotus corniculatus*	35	H	FAC
3. *Cyperus eragrostis*	10	H	FACW
4. *Helenium bigelovii*	10	H	OBL
5. *Centaurium muehlenbergii*	10	H	FAC
6.			
7.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100%

Remarks:

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
☐ Stream, Lake, or Tide Gauge
☒ Aerial Photographs
☐ Other
☐ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water: NA (in.)

Depth to Free Water in Pit: >16 (in.)

Depth to Saturated Soil >16 (in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:

☐ Inundated
☐ Saturated in upper 12 inches
☐ Water Marks
☒ Drift Lines
☐ Sediment Deposits
☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):

☒ Oxidized root channels in upper 12 inches
☐ Water-stained Leaves
☐ Local Soil Survey Data
☒ FAC-Neutral Test
☐ Other (explain in Remarks)

Remarks:

SOILS

Map Unit Name
(Series and Phase) ______________________________.

Drainage Class: ____________________.
Field Observations
Confirm Mapped Type? Yes No

Taxonomy (Subgroup): ______________________________

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
8-10		10 YR 2/2	7.5 YR ¾ 5 YR 4/6	HIGH	SILTY

Hydric Soil Indicators:

☐ Histosol
☐ Histic Epipedon
☐ Sulfidic Odor
☐ Aquic Moisture Regime
☐ Reducing Conditions
☑ Gleyed or Low-Chroma Colors

☐ Concretions
☐ High Organic Content in Surface Layer in Sandy Soils
☐ Organic Streaking in Sandy Soils
☐ Listed on Local Hydric Soils List
☐ Listed on National Hydric Soils List
☐ Other (Explain in Remarks)

Remarks:
0-16- SAME COLORS

WETLAND DETERMINATION

(Circle)
Hydrophytic Vegetation Present? [✓ Yes] No
Wetland Hydrology Present? [✓ Yes] No
Hydric Soils Present? [✓ Yes] No

(Circle)
Is this Sampling Point Within a Wetland? [✓ Yes] No

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site: Crystal Springs
Date: 07/28/06
Applicant/Owner: SFPUC
County: San Mateo
Investigator: K. Colgate, S. Ebrahim
State: California
Do Normal Circumstances exist on the site? ☒Yes ☐No
Community ID:
Is the site significantly disturbed (Atypical Situation)? ☐Yes ☒No
Plot ID: WET100
Is the area a potential Problem Area? ☐Yes ☒No
(If needed, explain on reverse side.)
Transect ID: 05 A

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. *Avena fatua*	30	H	NL (UPL)
2. *Centaurea solstitialis*	30	H	NL (UPL)
3. *Cynosurus cristatus*	20	H	FACW+
4. *Centaurea melitensis*	20	H	NL (UPL)
5. *Baccharis pilularis*	70	S	NL (UPL)
6. *Quercus agrifolia*	30	S	NL (UPL)
7. *Quercus agrifolius*	100	T	NL (UPL)

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 14

Remarks:

HYDROLOGY

- ☐ Recorded Data (Describe in Remarks):
- ☐ Stream, Lake, or Tide Gauge
- ☐ Aerial Photographs
- ☐ Other
- ☐ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water: ___NA___ (in.)

Depth to Free Water in Pit: ___>16___ (in.)

Depth to Saturated Soil ___>16___ (in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:
- ☐ Inundated
- ☐ Saturated in upper 12 inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ☐ Oxidized root channels in upper 12 inches
- ☐ Water-stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (explain in Remarks)

Remarks: * assumed from lower elevation pit ; above OHWM

SOILS

Map Unit Name
(Series and Phase) ______________________________.

Taxonomy (Subgroup): ______________________________

Drainage Class: ____________________.
Field Observations
Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.

Hydric Soil Indicators:

____ Histosol
____ Histic Epipedon
____ Sulfidic Odor
____ Aquic Moisture Regime
____ Reducing Conditions
____ Gleyed or Low-Chroma Colors

____ Concretions
____ High Organic Content in Surface Layer in Sandy Soils
____ Organic Streaking in Sandy Soils
____ Listed on Local Hydric Soils List
____ Listed on National Hydric Soils List
____ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

(Circle)
Hydrophytic Vegetation Present? Yes [✓ No]
Wetland Hydrology Present? Yes [✓ No]
Hydric Soils Present? Yes No

(Circle)
Is this Sampling Point Within a Wetland? Yes [✓ No]

Remarks: Veg not wetland- so did not survey soil

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site: Crystal Springs
Date: 07/28/06
Applicant/Owner: SFPUC
County: San Mateo
Investigator: K. Colgate, S. Ebrahim
State: California
Do Normal Circumstances exist on the site? ☒Yes ☐No
Community ID:
Is the site significantly disturbed (Atypical Situation)? ☐Yes ☒No
Plot ID: WET100
Is the area a potential Problem Area? ☐Yes ☒No
Transect ID: 05 B
(If needed, explain on reverse side.)

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. *Lolium multiflorum*	35	H	NL
2. *Phyla nodiflora*	35	H	FACW
3. *Lotus corniculatus*	10	H	FAC
4. *Mentha pulegium*	10	H	OBL
5. *Polypogon monspeliensis*	10	H	FACW+
6.			
7.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 80%

Remarks:

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
☐ Stream, Lake, or Tide Gauge
☒ Aerial Photographs
☐ Other
☐ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water: __NA____ (in.)

Depth to Free Water in Pit: __>16____ (in.)

Depth to Saturated Soil __>16____ (in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:
☐ Inundated
☐ Saturated in upper 12 inches
☐ Water Marks
☒ Drift Lines
☒ Sediment Deposits
☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
☒ Oxidized root channels in upper 12 inches
☐ Water-stained Leaves
☐ Local Soil Survey Data
☐ FAC-Neutral Test
☐ Other (explain in Remarks)

Remarks: Within OHWM

SOILS

Map Unit Name
(Series and Phase) ______________________________.
Taxonomy (Subgroup): ______________________________

Drainage Class: ____________________.
Field Observations
Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-5		10 YR 2/2	7.5 YR ¾ 5 YR 4/6	HIGH	SILTY
5-16*1		10 YR 2/1	7.5 YR ¾ 5 YR 4/6	HIGH	SILTY

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
___ Aquic Moisture Regime
___ Reducing Conditions
X Gleyed or Low-Chroma Colors

___ Concretions
___ High Organic Content in Surface Layer in Sandy Soils
___ Organic Streaking in Sandy Soils
___ Listed on Local Hydric Soils List
___ Listed on National Hydric Soils List
___ Other (Explain in Remarks)

Remarks:
*1 TOOK COLOR AT 8"

WETLAND DETERMINATION

(Circle)
Hydrophytic Vegetation Present? [✓ Yes] No
Wetland Hydrology Present? [✓ Yes] No
Hydric Soils Present? [✓ Yes] No

(Circle)
Is this Sampling Point Within a Wetland? [✓ Yes] No

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site:	Crystal Springs	Date:	09/06/06
Applicant/Owner:	SFPUC	County:	San Mateo
Investigator:	K. Colgate, S. Ebrahim	State:	California
Do Normal Circumstances exist on the site?	☒Yes ☐No	Community ID:	
Is the site significantly disturbed (Atypical Situation)?	☐Yes ☒No	Plot ID:	WET102
Is the area a potential Problem Area? (If needed, explain on reverse side.)	☐Yes ☒No	Transect ID:	1 A

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. Baccharis pilularis	30	S	NL
2. Toxicodendron diversilobum	30	S	NL
3. Rubus ursinus	30	S	NL
4.			
5.			
6.			
7			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 0

Remarks:

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
☐ Stream, Lake, or Tide Gauge
☐ Aerial Photographs
☐ Other
☐ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water:	N/A	(in.)
Depth to Free Water in Pit:	--	(in.)
Depth to Saturated Soil	--	(in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:
☐ Inundated
☐ Saturated in upper 12 inches
☐ Water Marks
☐ Drift Lines
☐ Sediment Deposits
☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
☐ Oxidized root channels in upper 12 inches
☐ Water-stained Leaves
☐ Local Soil Survey Data
☐ FAC-Neutral Test
☐ Other (explain in Remarks)

Remarks:

SOILS

Map Unit Name
(Series and Phase) ____________________.

Drainage Class: ____________________.

Taxonomy (Subgroup): ____________________

Field Observations
Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.

Hydric Soil Indicators:

____ Histosol
____ Histic Epipedon
____ Sulfidic Odor
____ Aquic Moisture Regime
____ Reducing Conditions
____ Gleyed or Low-Chroma Colors
____ Concretions
____ High Organic Content in Surface Layer in Sandy Soils
____ Organic Streaking in Sandy Soils
____ Listed on Local Hydric Soils List
____ Listed on National Hydric Soils List
____ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

	(Circle)			(Circle)	
Hydrophytic Vegetation Present?	Yes	[✓ No]			
Wetland Hydrology Present?	Yes	No			
Hydric Soils Present?	Yes	No	Is this Sampling Point Within a Wetland?	Yes	[✓ No]

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site:	Crystal Springs		Date:	09/06/06
Applicant/Owner:	SFPUC		County:	San Mateo
Investigator:	K. Colgate, S. Ebrahim		State:	California
Do Normal Circumstances exist on the site?	☒Yes	☐No	Community ID:	
Is the site significantly disturbed (Atypical Situation)?	☐Yes	☒No	Plot ID:	WET102
Is the area a potential Problem Area? (If needed, explain on reverse side.)	☐Yes	☒No	Transect ID:	1 B

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. Juncus mexicanus	98	H	FACW
2. Euthamia occidentalis	2	H	FACW
3.			
4.			
5.			
6.			
7			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100

Remarks:

HYDROLOGY

- ☐ Recorded Data (Describe in Remarks):
- ☐ Stream, Lake, or Tide Gauge
- ☒ Aerial Photographs
- ☐ Other
- ☐ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water:	N/A	(in.)
Depth to Free Water in Pit:	>12	(in.)
Depth to Saturated Soil	>12	(in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:

- ☐ Inundated
- ☐ Saturated in upper 12 inches
- ☐ Water Marks
- ☒ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):

- ☐ Oxidized root channels in upper 12 inches
- ☐ Water-stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (explain in Remarks)

Remarks:

SOILS

Map Unit Name
(Series and Phase) ______________________.
Taxonomy (Subgroup): ______________________

Drainage Class: ______________.
Field Observations
Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
8"		10 YR 3/2	7.5 YR ¾ & 5 YR 4/6		

Hydric Soil Indicators:

- ___ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- ___ Aquic Moisture Regime
- ___ Reducing Conditions
- X Gleyed or Low-Chroma Colors
- ___ Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- ___ Listed on Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- ___ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

(Circle)

Hydrophytic Vegetation Present? [✓ Yes] No
Wetland Hydrology Present? [✓ Yes] No
Hydric Soils Present? [✓ Yes] No

(Circle)

Is this Sampling Point Within a Wetland? [✓ Yes] No

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site: Crystal Springs
Date: 07/28/06
Applicant/Owner: SFPUC
County: San Mateo
Investigator: K. Colgate, S. Ebrahim
State: California
Do Normal Circumstances exist on the site? ☒Yes ☐No
Community ID:
Is the site significantly disturbed (Atypical Situation)? ☐Yes ☒No
Plot ID: WET102
Is the area a potential Problem Area? ☐Yes ☒No
(If needed, explain on reverse side.)
Transect ID: 02A A

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. *Cordylanthus pilosus*		H	NL
2. *Briza minor*		H	NL
3. *Cynosurus echinatus*		H	NL
4. *Cistus creticus*		S	NL
5. *Quercus agrifolia*		S	NL
6. *Arbutus menziesii*		S	NL
7. *Quercus agrifolia*		T	NL
8. *Arbutus menziesii*		T	NL

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 0

Remarks:

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
☐ Stream, Lake, or Tide Gauge
☐ Aerial Photographs
☐ Other
☐ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water: NA (in.)

Depth to Free Water in Pit: -- (in.)

Depth to Saturated Soil -- (in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:
☐ Inundated
☐ Saturated in upper 12 inches
☐ Water Marks
☐ Drift Lines
☐ Sediment Deposits
☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
☐ Oxidized root channels in upper 12 inches
☐ Water-stained Leaves
☐ Local Soil Survey Data
☐ FAC-Neutral Test
☐ Other (explain in Remarks)

Remarks:

SOILS

Map Unit Name
(Series and Phase) ______________________________.
Taxonomy (Subgroup): ______________________________

Drainage Class: ____________________.
Field Observations
Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
___ Aquic Moisture Regime
___ Reducing Conditions
___ Gleyed or Low-Chroma Colors
___ Concretions
___ High Organic Content in Surface Layer in Sandy Soils
___ Organic Streaking in Sandy Soils
___ Listed on Local Hydric Soils List
___ Listed on National Hydric Soils List
___ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

	(Circle)	
Hydrophytic Vegetation Present?	Yes	[✓ No]
Wetland Hydrology Present?	Yes	No
Hydric Soils Present?	Yes	No

(Circle)
Is this Sampling Point Within a Wetland? Yes [✓ No]

Remarks:
No pit- veg not wetland

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site:	Crystal Springs	Date:	07/28/06
Applicant/Owner:	SFPUC	County:	San Mateo
Investigator:	K. Colgate, S. Ebrahim	State:	California

Do Normal Circumstances exist on the site? ☒Yes ☐No — Community ID:

Is the site significantly disturbed (Atypical Situation)? ☐Yes ☒No — Plot ID: WET102

Is the area a potential Problem Area? ☐Yes ☒No — Transect ID: 02B B
(If needed, explain on reverse side.)

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. *Juncus bufonius*	25	H	FACW+
2. *Mentha pulegium*	30	H	OBL
3. *Phyla nodiflora*	10	H	FACW
4. *Lythrum tribacteatum*	10	H	OBL
5. *Polypogon monspeliensis*	25	H	FACW
6.			
7.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100%

Remarks:

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
☐ Stream, Lake, or Tide Gauge
☒ Aerial Photographs
☐ Other
☐ No Recorded Data Available

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:
☐ Inundated
☐ Saturated in upper 12 inches
☐ Water Marks
☒ Drift Lines
☒ Sediment Deposits
☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
☒ Oxidized root channels in upper 12 inches
☐ Water-stained Leaves
☐ Local Soil Survey Data
☐ FAC-Neutral Test
☐ Other (explain in Remarks)

FIELD OBSERVATIONS:

Depth of Surface Water: __NA____ (in.)

Depth to Free Water in Pit: __>16_ (in.)

Depth to Saturated Soil __>16_ (in.)

Remarks:

SOILS

Map Unit Name
(Series and Phase) ______________________.
Drainage Class: ______________.
Field Observations
Confirm Mapped Type? Yes No

Taxonomy (Subgroup): ______________________

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-16		10 YR 3/2	5 YR 4/6 5 YR 5/8	MODERATE/	Some sand,very silty

Hydric Soil Indicators:

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☐ Reducing Conditions
- ☑ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☐ Listed on Local Hydric Soils List
- ☐ Listed on National Hydric Soils List
- ☐ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

(Circle)
Hydrophytic Vegetation Present? [✓ Yes] No
Wetland Hydrology Present? [✓ Yes] No
Hydric Soils Present? [✓ Yes] No

(Circle)
Is this Sampling Point Within a Wetland? [✓ Yes] No

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site: Crystal Springs
Date: 07/28/06
Applicant/Owner: SFPUC
County: San Mateo
Investigator: K. Colgate, S. Ebrahim
State: California
Do Normal Circumstances exist on the site? ☒Yes ☐No
Community ID:
Is the site significantly disturbed (Atypical Situation)? ☐Yes ☒No
Plot ID: WET102
Is the area a potential Problem Area? ☐Yes ☒No
(If needed, explain on reverse side.)
Transect ID: 02C-C

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. *Phyla nodiflora*	15	H	FACW
2. *Polypogon monspeliensis*	55	H	FACW+
3. *Mentha pulegium*	15	H	OBL
4. *Scirpus cernuus*	15	H	OBL
5.			
6.			
7.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100

Remarks:

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
☐ Stream, Lake, or Tide Gauge
☒ Aerial Photographs
☐ Other
☐ No Recorded Data Available

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:
☐ Inundated
☐ Saturated in upper 12 inches
☐ Water Marks
☒ Drift Lines
☒ Sediment Deposits
☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
☒ Oxidized root channels in upper 12 inches
☐ Water-stained Leaves
☐ Local Soil Survey Data
☐ FAC-Neutral Test
☐ Other (explain in Remarks)

FIELD OBSERVATIONS:

Depth of Surface Water: ___NA___ (in.)

Depth to Free Water in Pit: ___>16___ (in.)

Depth to Saturated Soil ___>16___ (in.)

Remarks: Algal mat; within OHWM

SOILS

Map Unit Name
(Series and Phase) ______________________________.
Taxonomy (Subgroup): ______________________________

Drainage Class: ____________________.
Field Observations
Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-12		10 YR 2/3	5 YR 4/6	High/	silty

Hydric Soil Indicators:

- ___ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- ___ Aquic Moisture Regime
- ___ Reducing Conditions
- ___ Gleyed or Low-Chroma Colors
- ___ Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- ___ Listed on Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- ___ Other (Explain in Remarks)

Remarks:
Possibly fill from road – moved a few feet away, out of the fill area, and found wetland soil (see pit B) – this is a small area, and will be included within the wetland

WETLAND DETERMINATION

(Circle)
Hydrophytic Vegetation Present? [✓ Yes] No
Wetland Hydrology Present? Yes [✓ No]
Hydric Soils Present? [✓ Yes] No

(Circle)
Is this Sampling Point Within a Wetland? Yes [✓ No]

Remarks:

Possible road grade connecting Durwood and Carp Coves - Appears to be old fill shows mottling.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site:	Crystal Springs	Date:	07/28/06
Applicant/Owner:	SFPUC	County:	San Mateo
Investigator:	K. Colgate, S. Ebrahim	State:	California
Do Normal Circumstances exist on the site?	☒Yes ☐No	Community ID:	
Is the site significantly disturbed (Atypical Situation)?	☐Yes ☒No	Plot ID:	WET102
Is the area a potential Problem Area? (If needed, explain on reverse side.)	☐Yes ☒No	Transect ID:	03 A

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. *Carex lenticularis.*	70	H	NL
2. *Rubus ursinus.*	10	S	NL
3. *Toxicodendron diversilobum*	20	S	NL
4. *Baccharis pilularis*	60	S	NL
5. *Quercus agrifolia*	100	T	NL
6. *Rhamnus californicus*	10	S	NL
7. *Navarrettia pubescens.*	30	H	NL

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 0

Remarks:

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
☐ Stream, Lake, or Tide Gauge
☐ Aerial Photographs
☐ Other
☐ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water: N/A (in.)

Depth to Free Water in Pit: -- (in.)

Depth to Saturated Soil -- (in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:
☐ Inundated
☐ Saturated in upper 12 inches
☐ Water Marks
☐ Drift Lines
☐ Sediment Deposits
☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
☐ Oxidized root channels in upper 12 inches
☐ Water-stained Leaves
☐ Local Soil Survey Data
☐ FAC-Neutral Test
☐ Other (explain in Remarks)

Remarks: No veg- so no pit

SOILS

Map Unit Name
(Series and Phase) ______________________.
Drainage Class: ______________.
Taxonomy (Subgroup): ______________________
Field Observations
Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
___ Aquic Moisture Regime
___ Reducing Conditions
___ Gleyed or Low-Chroma Colors
___ Concretions
___ High Organic Content in Surface Layer in Sandy Soils
___ Organic Streaking in Sandy Soils
___ Listed on Local Hydric Soils List
___ Listed on National Hydric Soils List
___ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

	(Circle)	
Hydrophytic Vegetation Present?	Yes	[✓ No]
Wetland Hydrology Present?	Yes	No
Hydric Soils Present?	Yes	No

Is this Sampling Point Within a Wetland? (Circle) Yes [✓ No]

Remarks:
No pit- veg not wetland

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site: Crystal Springs
Date: 07/28/06
Applicant/Owner: SFPUC
County: San Mateo
Investigator: K. Colgate, S. Ebrahim
State: California
Do Normal Circumstances exist on the site? ☒Yes ☐No
Community ID:
Is the site significantly disturbed (Atypical Situation)? ☐Yes ☒No
Plot ID: WET102
Is the area a potential Problem Area? ☐Yes ☒No
(If needed, explain on reverse side.)
Transect ID: 03 B

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. *Phyla nodiflora*	30	H	FACW
2. *Cyperus eragrostis*	10	H	FACW
3. *Mentha pulegium*	30	H	OBL
4. *Juncus bufonius*	25	H	FACW+
5.			
6.			
7.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100

Remarks:

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
☐ Stream, Lake, or Tide Gauge
☒ Aerial Photographs
☐ Other
☐ No Recorded Data Available

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:
☐ Inundated
☐ Saturated in upper 12 inches
☐ Water Marks
☒ Drift Lines
☒ Sediment Deposits
☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
☐ Oxidized root channels in upper 12 inches
☐ Water-stained Leaves
☐ Local Soil Survey Data
☐ FAC-Neutral Test
☐ Other (explain in Remarks)

FIELD OBSERVATIONS:

Depth of Surface Water: NA (in.)
Depth to Free Water in Pit: >16 (in.)
Depth to Saturated Soil >16 (in.)

Remarks:

SOILS

Map Unit Name
(Series and Phase) ______________________. Drainage Class: ______________.
Field Observations
Taxonomy (Subgroup): ______________________ Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-11		10 YR 2/2	7.5 YR ¾ 5 YR 4/6	HIGH	SITLY

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
___ Aquic Moisture Regime
___ Reducing Conditions
_X_ Gleyed or Low-Chroma Colors

___ Concretions
___ High Organic Content in Surface Layer in Sandy Soils
___ Organic Streaking in Sandy Soils
___ Listed on Local Hydric Soils List
___ Listed on National Hydric Soils List
___ Other (Explain in Remarks)

Remarks:
Hit hardpan @ 11"

WETLAND DETERMINATION

	(Circle)	
Hydrophytic Vegetation Present?	[✓ Yes]	No
Wetland Hydrology Present?	[✓ Yes]	No
Hydric Soils Present?	[✓ Yes]	No

(Circle)
Is this Sampling Point Within a Wetland? [✓ Yes] No

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site:	Crystal Springs	Date:	07/26/06
Applicant/Owner:	SFPUC	County:	San Mateo
Investigator:	K. Colgate, S. Ebrahim	State:	California
Do Normal Circumstances exist on the site?	☒Yes ☐No	Community ID:	
Is the site significantly disturbed (Atypical Situation)?	☐Yes ☒No	Plot ID:	WET102
Is the area a potential Problem Area? (If needed, explain on reverse side.)	☐Yes ☒No	Transect ID:	04 A

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1 *Baccharis pilularis*	30	H	NL
2. *Rubus ursinus*	30	S	NL
3. *Toxicodendron diversilobum*	30	S	NL
4.			
5.			
6.			
7.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 0

Remarks:

HYDROLOGY

- ☐ Recorded Data (Describe in Remarks):
- ☐ Stream, Lake, or Tide Gauge
- ☐ Aerial Photographs
- ☐ Other
- ☐ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water:	N/A	(in.)
Depth to Free Water in Pit:	--	(in.)
Depth to Saturated Soil	--	(in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:

- ☐ Inundated
- ☐ Saturated in upper 12 inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):

- ☐ Oxidized root channels in upper 12 inches
- ☐ Water-stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (explain in Remarks)

Remarks:

SOILS

Map Unit Name
(Series and Phase) ______________________________.
Taxonomy (Subgroup): ______________________________

Drainage Class: ______________________.
Field Observations
Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.

Hydric Soil Indicators:

____ Histosol
____ Histic Epipedon
____ Sulfidic Odor
____ Aquic Moisture Regime
____ Reducing Conditions
____ Gleyed or Low-Chroma Colors

____ Concretions
____ High Organic Content in Surface Layer in Sandy Soils
____ Organic Streaking in Sandy Soils
____ Listed on Local Hydric Soils List
____ Listed on National Hydric Soils List
____ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

(Circle)
Hydrophytic Vegetation Present? Yes [✓ No]
Wetland Hydrology Present? Yes No
Hydric Soils Present? Yes No

(Circle)
Is this Sampling Point Within a Wetland? Yes [✓ No]

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site:	Crystal Springs	Date:	09/06/06
Applicant/Owner:	SFPUC	County:	San Mateo
Investigator:	K. Colgate, S. Ebrahim	State:	California
Do Normal Circumstances exist on the site?	☒Yes ☐No	Community ID:	
Is the site significantly disturbed (Atypical Situation)?	☐Yes ☒No	Plot ID:	WET102
Is the area a potential Problem Area? (If needed, explain on reverse side.)	☐Yes ☒No	Transect ID:	04 B

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1 *Salix lasiolep*s	100	T	FACW
2. *Rubus ursinus*	100	V	NL
3.			
4.			
5.			
6.			
7.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 50%*

Remarks: **Salix lasioleps* very dominant over *Rubus* spp. – considering as wetland vegetation

HYDROLOGY

- ☐ Recorded Data (Describe in Remarks):
- ☐ Stream, Lake, or Tide Gauge
- ☒ Aerial Photographs
- ☐ Other
- ☐ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water:	N/A	(in.)
Depth to Free Water in Pit:	>16	(in.)
Depth to Saturated Soil	>16	(in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:
- ☐ Inundated
- ☐ Saturated in upper 12 inches
- ☐ Water Marks
- ☒ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ☐ Oxidized root channels in upper 12 inches
- ☐ Water-stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (explain in Remarks)

Remarks:

SOILS

Map Unit Name
(Series and Phase) ______________________________.
Taxonomy (Subgroup): ______________________________

Drainage Class: ____________________.
Field Observations
Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
	10 YR 2/2	5 YR 4/6			

Hydric Soil Indicators:

____ Histosol
____ Histic Epipedon
____ Sulfidic Odor
____ Aquic Moisture Regime
____ Reducing Conditions
X Gleyed or Low-Chroma Colors

____ Concretions
____ High Organic Content in Surface Layer in Sandy Soils
____ Organic Streaking in Sandy Soils
____ Listed on Local Hydric Soils List
____ Listed on National Hydric Soils List
____ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

(Circle)
Hydrophytic Vegetation Present? [✓ Yes] No
Wetland Hydrology Present? [✓ Yes] No
Hydric Soils Present? [✓ Yes] No

(Circle)
Is this Sampling Point Within a Wetland? [✓ Yes] No

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site:	Crystal Springs	Date:	09/06/06
Applicant/Owner:	SFPUC	County:	San Mateo
Investigator:	K. Colgate, S. Ebrahim	State:	California
Do Normal Circumstances exist on the site?	☒Yes ☐No	Community ID:	
Is the site significantly disturbed (Atypical Situation)?	☐Yes ☒No	Plot ID:	WET102
Is the area a potential Problem Area? (If needed, explain on reverse side.)	☐Yes ☒No	Transect ID:	05-A

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1 *Carex lenticularis*	100	H	NL*
2 *Baccharis pilularis*	30	S	NL
3. *Toxicodendron diversilobum*	30	S	NL
4. *Arbutus menziesii*	40	S	NL
5. *Arbutus menziesii*	40	T	NL
6. *Quercus agrifolia*	40	T	NL
7.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 0

Remarks: *National indicator status = FACW/OBL

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
☐ Stream, Lake, or Tide Gauge
☐ Aerial Photographs
☐ Other
☐ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water:	N/A	(in.)
Depth to Free Water in Pit:	---	(in.)
Depth to Saturated Soil	---	(in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:
☐ Inundated
☐ Saturated in upper 12 inches
☐ Water Marks
☐ Drift Lines
☐ Sediment Deposits
☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
☐ Oxidized root channels in upper 12 inches
☐ Water-stained Leaves
☐ Local Soil Survey Data
☐ FAC-Neutral Test
☐ Other (explain in Remarks)

Remarks: Algal mat

SOILS

Map Unit Name
(Series and Phase) ______________________________________.
Drainage Class: ______________________.
Field Observations
Confirm Mapped Type? Yes No
Taxonomy (Subgroup): ______________________________________

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.

Hydric Soil Indicators:

- ___ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- ___ Aquic Moisture Regime
- ___ Reducing Conditions
- ___ Gleyed or Low-Chroma Colors
- ___ Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- ___ Listed on Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- ___ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

(Circle)
Hydrophytic Vegetation Present? Yes [✓ No]
Wetland Hydrology Present? Yes No
Hydric Soils Present? Yes No

(Circle)
Is this Sampling Point Within a Wetland? Yes [✓ No]

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site: Crystal Springs
Date: 09/06/06
Applicant/Owner: SFPUC
County: San Mateo
Investigator: K. Colgate, S. Ebrahim
State: California
Do Normal Circumstances exist on the site? ☒Yes ☐No
Community ID:
Is the site significantly disturbed (Atypical Situation)? ☐Yes ☒No
Plot ID: WET102
Is the area a potential Problem Area? ☐Yes ☒No
(If needed, explain on reverse side.)
Transect ID: 05 B

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1 *Phyla nodiflora*	30	H	FACW
2 *Cyperus eragrostis*	10	H	FACW
3. *Rumex crispus*	15	H	FACW-
4. *Eleocharis montevidensis*	10	H	FACW
5. *Scirpus cernuus*	30	H	OBL
6.			
7.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100

Remarks: * mostly dead; also *Mentha pulegium, Carex lenticularis, Polygonum amphibium*

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
☐ Stream, Lake, or Tide Gauge
☒ Aerial Photographs
☐ Other
☐ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water: n/a (in.)

Depth to Free Water in Pit: -- (in.)

Depth to Saturated Soil -- (in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:
☐ Inundated
☐ Saturated in upper 12 inches
☐ Water Marks
☒ Drift Lines
☐ Sediment Deposits
☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
☐ Oxidized root channels in upper 12 inches
☐ Water-stained Leaves
☐ Local Soil Survey Data
☐ FAC-Neutral Test
☐ Other (explain in Remarks)

Remarks: Algal mat

SOILS

Map Unit Name
(Series and Phase) ______________________________.
Drainage Class: ____________________.
Field Observations
Confirm Mapped Type? Yes No

Taxonomy (Subgroup): ______________________________

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
8”	10 YR 2/2	5 YR 4/6			Mottles @ 8”

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
___ Aquic Moisture Regime
___ Reducing Conditions
X Gleyed or Low-Chroma Colors

___ Concretions
___ High Organic Content in Surface Layer in Sandy Soils
___ Organic Streaking in Sandy Soils
___ Listed on Local Hydric Soils List
___ Listed on National Hydric Soils List
___ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

(Circle)
Hydrophytic Vegetation Present? [✓ Yes] No
Wetland Hydrology Present? [✓ Yes] No
Hydric Soils Present? [✓ Yes] No

(Circle)
Is this Sampling Point Within a Wetland? [✓ Yes] No

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 CoE WETLANDS DELINEATION MANUAL)

Project/Site: Crystal Springs
Date: 07/28/06
Applicant/Owner: SFPUC
County: San Mateo
Investigator: K. Colgate, S. Ebrahim
State: California
Do Normal Circumstances exist on the site? ☒Yes ☐No
Community ID:
Is the site significantly disturbed (Atypical Situation)? ☐Yes ☒No
Plot ID: WET102
Is the area a potential Problem Area? ☐Yes ☒No
(If needed, explain on reverse side.)
Transect ID: 06 A

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. *Toxicodendron diversilobum*	100	S	NL
2. *Quercus agrifolia*	100	T	NL
3.			
4.			
5.			
6.			
7.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 0

Remarks:

HYDROLOGY

- ☐ Recorded Data (Describe in Remarks):
- ☐ Stream, Lake, or Tide Gauge
- ☐ Aerial Photographs
- ☐ Other
- ☐ No Recorded Data Available

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:

- ☐ Inundated
- ☐ Saturated in upper 12 inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):

- ☐ Oxidized root channels in upper 12 inches
- ☐ Water-stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (explain in Remarks)

FIELD OBSERVATIONS:

Depth of Surface Water: NA (in.)

Depth to Free Water in Pit: ______ (in.)

Depth to Saturated Soil ______ (in.)

Remarks:

SOILS

Map Unit Name
(Series and Phase) ______________________________. Drainage Class: ______________.
Field Observations
Taxonomy (Subgroup): ______________________________ Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.

Hydric Soil Indicators:

____ Histosol
____ Histic Epipedon
____ Sulfidic Odor
____ Aquic Moisture Regime
____ Reducing Conditions
____ Gleyed or Low-Chroma Colors
____ Concretions
____ High Organic Content in Surface Layer in Sandy Soils
____ Organic Streaking in Sandy Soils
____ Listed on Local Hydric Soils List
____ Listed on National Hydric Soils List
____ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

(Circle)
Hydrophytic Vegetation Present? Yes [✓ No]
Wetland Hydrology Present? Yes No
Hydric Soils Present? Yes No

(Circle)
Is this Sampling Point Within a Wetland? Yes [✓ No]

Remarks:
VEG NOT WETLAND, NO PIT

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site: Crystal Springs
Date: 07/28/06
Applicant/Owner: SFPUC
County: San Mateo
Investigator: K. Colgate, S. Ebrahim
State: California
Do Normal Circumstances exist on the site? ☒Yes ☐No
Community ID:
Is the site significantly disturbed (Atypical Situation)? ☐Yes ☒No
Plot ID: WET102
Is the area a potential Problem Area? ☐Yes ☒No
(If needed, explain on reverse side.)
Transect ID: 06 B

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. *Eleocharis montevidensis*	85	H	FACW
2. *Juncus mexicanus*	15	H	FACW
3.			
4.			
5.			
6.			
7.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100%

Remarks:

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
☐ Stream, Lake, or Tide Gauge
☒ Aerial Photographs
☐ Other
☐ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water: ___NA_ (in.)

Depth to Free Water in Pit: ___>12 (in.)

Depth to Saturated Soil __4___ (in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:
☐ Inundated
☒ Saturated in upper 12 inches
☐ Water Marks
☐ Drift Lines
☒ Sediment Deposits
☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
☐ Oxidized root channels in upper 12 inches
☐ Water-stained Leaves
☐ Local Soil Survey Data
☒ FAC-Neutral Test
☐ Other (explain in Remarks)

Remarks: Algal mat

SOILS

Map Unit Name
(Series and Phase) ______________________. Drainage Class: ______________.
Field Observations
Taxonomy (Subgroup): ______________________ Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-12		10 YR 2/1			Silty clay

Hydric Soil Indicators:

- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☐ Reducing Conditions
- ☑ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Organic Streaking in Sandy Soils
- ☐ Listed on Local Hydric Soils List
- ☐ Listed on National Hydric Soils List
- ☐ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

(Circle)
Hydrophytic Vegetation Present? [✓ Yes] No
Wetland Hydrology Present? [✓ Yes] No
Hydric Soils Present? [✓ Yes] No

(Circle)
Is this Sampling Point Within a Wetland? [✓ Yes] No

Remarks:
Innermost section saturated @ surface. Channel (vegetated by willows) between larger channel and this wetland.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 CoE WETLANDS DELINEATION MANUAL)

Project/Site:	Crystal Springs	Date:	07/26/06
Applicant/Owner:	SFPUC	County:	San Mateo
Investigator:	K. Colgate, S. Ebrahim	State:	California
Do Normal Circumstances exist on the site?	☒Yes ☐No	Community ID:	
Is the site significantly disturbed (Atypical Situation)?	☐Yes ☒No	Plot ID:	WET103
Is the area a potential Problem Area? (If needed, explain on reverse side.)	☐Yes ☒No	Transect ID:	1 A

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. *Bromus hordeaceus*	70	H	NL
2. *Conyza canadensis*	15	H	FAC
3. *Dipsacus fullonum*	15	H	NI
4.			
5.			
6.			
7			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 33

Remarks:

HYDROLOGY

- ☐ Recorded Data (Describe in Remarks):
- ☐ Stream, Lake, or Tide Gauge
- ☐ Aerial Photographs
- ☐ Other
- ☐ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water: N/A (in.)

Depth to Free Water in Pit: -- (in.)

Depth to Saturated Soil -- (in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:

- ☐ Inundated
- ☐ Saturated in upper 12 inches
- ☐ Water Marks
- ☒ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):

- ☐ Oxidized root channels in upper 12 inches
- ☐ Water-stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (explain in Remarks)

Remarks:

SOILS

Map Unit Name
(Series and Phase) ______________________________. Drainage Class: ____________________.
Field Observations
Taxonomy (Subgroup): ______________________________ Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.

Hydric Soil Indicators:

- ___ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- ___ Aquic Moisture Regime
- ___ Reducing Conditions
- ___ Gleyed or Low-Chroma Colors
- ___ Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- ___ Listed on Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- ___ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

(Circle)
Hydrophytic Vegetation Present? Yes [✓ No]
Wetland Hydrology Present? Yes No
Hydric Soils Present? Yes No

(Circle)
Is this Sampling Point Within a Wetland? Yes [✓ No]

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site: Crystal Springs
Date: 09/04/06
Applicant/Owner: SFPUC
County: San Mateo
Investigator: K. Colgate, S. Ebrahim
State: California
Do Normal Circumstances exist on the site? ☒Yes ☐No
Community ID:
Is the site significantly disturbed (Atypical Situation)? ☐Yes ☒No
Plot ID: WET103
Is the area a potential Problem Area? ☐Yes ☒No
(If needed, explain on reverse side.)
Transect ID: 1
B

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. *Euthamia occidentalis*	30	H	OBL
2. *Phyla nodiflora*	30	H	FACW
3. *Mentha pulegium*	30	H	OBL
4.			
5.			
6.			
7			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100

Remarks:

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
☐ Stream, Lake, or Tide Gauge
☒ Aerial Photographs
☐ Other
☐ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water: N/A (in.)
Depth to Free Water in Pit: >12 (in.)
Depth to Saturated Soil >12 (in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:
☐ Inundated
☐ Saturated in upper 12 inches
☐ Water Marks
☒ Drift Lines
☐ Sediment Deposits
☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
☐ Oxidized root channels in upper 12 inches
☐ Water-stained Leaves
☐ Local Soil Survey Data
☐ FAC-Neutral Test
☐ Other (explain in Remarks)

Remarks:

SOILS

Map Unit Name
(Series and Phase) ________________________.

Drainage Class: ____________.

Field Observations
Confirm Mapped Type? Yes No

Taxonomy (Subgroup): ________________________

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
8"		10 YR 3/2	7.5 YR ¾ & 5 YR 4/6		

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
___ Aquic Moisture Regime
___ Reducing Conditions
_X_ Gleyed or Low-Chroma Colors
___ Concretions
___ High Organic Content in Surface Layer in Sandy Soils
___ Organic Streaking in Sandy Soils
___ Listed on Local Hydric Soils List
___ Listed on National Hydric Soils List
___ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

(Circle)
Hydrophytic Vegetation Present? [✓ Yes] No
Wetland Hydrology Present? [✓ Yes] No
Hydric Soils Present? [✓ Yes] No

(Circle)
Is this Sampling Point Within a Wetland? [✓ Yes] No

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site: Crystal Springs
Date: 07/31/06
Applicant/Owner: SFPUC
County: San Mateo
Investigator: K. Colgate, S. Ebrahim
State: California
Do Normal Circumstances exist on the site? ☒Yes ☐No
Community ID:
Is the site significantly disturbed (Atypical Situation)? ☐Yes ☒No
Plot ID: WET105
Is the area a potential Problem Area? ☐Yes ☒No
(If needed, explain on reverse side.)
Transect ID: 1
A

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. *Cortaderia selloana*	100	S	NL
2.			
3.			
4.			
5.			
6.			
7			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 0

Remarks:

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
☐ Stream, Lake, or Tide Gauge
☐ Aerial Photographs
☐ Other
☐ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water: N/A (in.)

Depth to Free Water in Pit: -- (in.)

Depth to Saturated Soil -- (in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:
☐ Inundated
☐ Saturated in upper 12 inches
☐ Water Marks
☐ Drift Lines
☐ Sediment Deposits
☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
☐ Oxidized root channels in upper 12 inches
☐ Water-stained Leaves
☐ Local Soil Survey Data
☐ FAC-Neutral Test
☐ Other (explain in Remarks)

Remarks:

SOILS

Map Unit Name
(Series and Phase) ____________________________.
Drainage Class: ____________________.
Field Observations
Confirm Mapped Type? Yes No
Taxonomy (Subgroup): ____________________________

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.

Hydric Soil Indicators:

- ____ Histosol
- ____ Histic Epipedon
- ____ Sulfidic Odor
- ____ Aquic Moisture Regime
- ____ Reducing Conditions
- ____ Gleyed or Low-Chroma Colors
- ____ Concretions
- ____ High Organic Content in Surface Layer in Sandy Soils
- ____ Organic Streaking in Sandy Soils
- ____ Listed on Local Hydric Soils List
- ____ Listed on National Hydric Soils List
- ____ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

	(Circle)			(Circle)
Hydrophytic Vegetation Present?	Yes [✓ No]			
Wetland Hydrology Present?	Yes No			
Hydric Soils Present?	Yes No		Is this Sampling Point Within a Wetland?	Yes [✓ No]

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site:	Crystal Springs	Date:	07/31/06
Applicant/Owner:	SFPUC	County:	San Mateo
Investigator:	K. Colgate, S. Ebrahim	State:	California
Do Normal Circumstances exist on the site?	☒Yes ☐No	Community ID:	
Is the site significantly disturbed (Atypical Situation)?	☐Yes ☒No	Plot ID:	WET105
Is the area a potential Problem Area? (If needed, explain on reverse side.)	☐Yes ☒No	Transect ID:	1-B

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. *Phyla nodiflora*	40	H	FACW
2. *Paspalum distichum*	40	H	OBL
3. *Euthamia occidentalis*	23	H	OBL
4.			
5.			
6.			
7			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100

Remarks:

HYDROLOGY

- ☐ Recorded Data (Describe in Remarks):
- ☐ Stream, Lake, or Tide Gauge
- ☒ Aerial Photographs
- ☐ Other
- ☐ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water:	N/A	(in.)
Depth to Free Water in Pit:	>12	(in.)
Depth to Saturated Soil	>12	(in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:
- ☐ Inundated
- ☐ Saturated in upper 12 inches
- ☐ Water Marks
- ☒ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ☐ Oxidized root channels in upper 12 inches
- ☐ Water-stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (explain in Remarks)

Remarks:

SOILS

Map Unit Name
(Series and Phase) ____.
Taxonomy (Subgroup): ____

Drainage Class: ____________________.
Field Observations
Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
8"		5 Y 4 /1	7.5 YR 4/6		

Hydric Soil Indicators:

____ Histosol
____ Histic Epipedon
____ Sulfidic Odor
____ Aquic Moisture Regime
____ Reducing Conditions
X Gleyed or Low-Chroma Colors

____ Concretions
____ High Organic Content in Surface Layer in Sandy Soils
____ Organic Streaking in Sandy Soils
____ Listed on Local Hydric Soils List
____ Listed on National Hydric Soils List
____ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

(Circle)
Hydrophytic Vegetation Present? [✓ Yes] No
Wetland Hydrology Present? [✓ Yes] No
Hydric Soils Present? [✓ Yes] No

(Circle)
Is this Sampling Point Within a Wetland? [✓ Yes] No

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site: Crystal Springs
Date: 07/31/06
Applicant/Owner: SFPUC
County: San Mateo
Investigator: K. Colgate, S. Ebrahim
State: California
Do Normal Circumstances exist on the site? ☒Yes ☐No
Community ID:
Is the site significantly disturbed (Atypical Situation)? ☐Yes ☒No
Plot ID: WET109
Is the area a potential Problem Area? ☐Yes ☒No
Transect ID: 1
(If needed, explain on reverse side.)
A

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. *Cortaderia selloana*	100	H	NL
2. *Baccharis pilularis*	100	S	NL
3.			
4.			
5.			
6.			
7			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 0

Remarks:

HYDROLOGY

- ☐ Recorded Data (Describe in Remarks):
- ☐ Stream, Lake, or Tide Gauge
- ☐ Aerial Photographs
- ☐ Other
- ☐ No Recorded Data Available

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:

- ☐ Inundated
- ☐ Saturated in upper 12 inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):

- ☐ Oxidized root channels in upper 12 inches
- ☐ Water-stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (explain in Remarks)

FIELD OBSERVATIONS:

Depth of Surface Water: N/A (in.)

Depth to Free Water in Pit: -- (in.)

Depth to Saturated Soil -- (in.)

Remarks:

SOILS

Map Unit Name
(Series and Phase) ____.

Taxonomy (Subgroup): ____________________________________

Drainage Class: ____________________.
Field Observations
Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.

Hydric Soil Indicators:

- ____ Histosol
- ____ Histic Epipedon
- ____ Sulfidic Odor
- ____ Aquic Moisture Regime
- ____ Reducing Conditions
- ____ Gleyed or Low-Chroma Colors
- ____ Concretions
- ____ High Organic Content in Surface Layer in Sandy Soils
- ____ Organic Streaking in Sandy Soils
- ____ Listed on Local Hydric Soils List
- ____ Listed on National Hydric Soils List
- ____ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

(Circle)

Hydrophytic Vegetation Present? Yes [✓ No]
Wetland Hydrology Present? Yes No
Hydric Soils Present? Yes No

(Circle)

Is this Sampling Point Within a Wetland? Yes [✓ No]

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site:	Crystal Springs	Date:	07/31/06
Applicant/Owner:	SFPUC	County:	San Mateo
Investigator:	K. Colgate, S. Ebrahim	State:	California
Do Normal Circumstances exist on the site?	☒Yes ☐No	Community ID:	
Is the site significantly disturbed (Atypical Situation)?	☐Yes ☒No	Plot ID:	WET109
Is the area a potential Problem Area? (If needed, explain on reverse side.)	☐Yes ☒No	Transect ID:	1 B

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. *Salix exigua*	100	T	OBL
2.			
3.			
4.			
5.			
6.			
7			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100

Remarks:

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
☐ Stream, Lake, or Tide Gauge
☒ Aerial Photographs
☐ Other
☐ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water:	N/A	(in.)
Depth to Free Water in Pit:	>12	(in.)
Depth to Saturated Soil	>12	(in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:

☐ Inundated
☐ Saturated in upper 12 inches
☐ Water Marks
☒ Drift Lines
☐ Sediment Deposits
☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):

☐ Oxidized root channels in upper 12 inches
☐ Water-stained Leaves
☐ Local Soil Survey Data
☐ FAC-Neutral Test
☐ Other (explain in Remarks)

Remarks:

Wet109_TR1_PitB.doc

SOILS

Map Unit Name
(Series and Phase) ______________________________.

Taxonomy (Subgroup): ______________________________

Drainage Class: ____________________.
Field Observations
Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
8”		5 Y 4/1			

Hydric Soil Indicators:

____ Histosol
____ Histic Epipedon
____ Sulfidic Odor
____ Aquic Moisture Regime
____ Reducing Conditions
_X_ Gleyed or Low-Chroma Colors

____ Concretions
____ High Organic Content in Surface Layer in Sandy Soils
____ Organic Streaking in Sandy Soils
____ Listed on Local Hydric Soils List
____ Listed on National Hydric Soils List
____ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

(Circle)
Hydrophytic Vegetation Present? [✓ Yes] No
Wetland Hydrology Present? [✓ Yes] No
Hydric Soils Present? [✓ Yes] No

(Circle)
Is this Sampling Point Within a Wetland? [✓ Yes] No

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site: Crystal Springs
Date: 7/3106
Applicant/Owner: SFPUC
County: San Mateo
Investigator: K. Colgate, S. Ebrahim
State: California
Do Normal Circumstances exist on the site? ☒Yes ☐No
Community ID:
Is the site significantly disturbed (Atypical Situation)? ☐Yes ☒No
Plot ID: WET111
Is the area a potential Problem Area? ☐Yes ☒No
(If needed, explain on reverse side.)
Transect ID: 1
A

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. *Avena fatua*		H	NL
2. *Carduus pycnocephalus*		H	NL
3. *Centaurea solstitialis*		H	NL
4. *Baccharis pilularis*		S	NL
5. *Toxicodendron diversilobum*		S	NL
6.			
7			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 0

Remarks:

HYDROLOGY

- ☐ Recorded Data (Describe in Remarks):
- ☐ Stream, Lake, or Tide Gauge
- ☐ Aerial Photographs
- ☐ Other
- ☐ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water: N/A (in.)

Depth to Free Water in Pit: -- (in.)

Depth to Saturated Soil -- (in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:

- ☐ Inundated
- ☐ Saturated in upper 12 inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):

- ☐ Oxidized root channels in upper 12 inches
- ☐ Water-stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (explain in Remarks)

Remarks:

Wet111_TR1_PitA.doc

SOILS

Map Unit Name
(Series and Phase) ____________________. Drainage Class: ____________.
Field Observations
Taxonomy (Subgroup): ____________________ Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.

Hydric Soil Indicators:

- ____ Histosol
- ____ Histic Epipedon
- ____ Sulfidic Odor
- ____ Aquic Moisture Regime
- ____ Reducing Conditions
- ____ Gleyed or Low-Chroma Colors
- ____ Concretions
- ____ High Organic Content in Surface Layer in Sandy Soils
- ____ Organic Streaking in Sandy Soils
- ____ Listed on Local Hydric Soils List
- ____ Listed on National Hydric Soils List
- ____ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

	(Circle)	
Hydrophytic Vegetation Present?	Yes	[✓ No]
Wetland Hydrology Present?	Yes	No
Hydric Soils Present?	Yes	No

(Circle)
Is this Sampling Point Within a Wetland? Yes [✓ No]

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site: Crystal Springs
Date: 07/31/06
Applicant/Owner: SFPUC
County: San Mateo
Investigator: K. Colgate, S. Ebrahim
State: California
Do Normal Circumstances exist on the site? ☒Yes ☐No
Community ID:
Is the site significantly disturbed (Atypical Situation)? ☐Yes ☒No
Plot ID: WET111
Is the area a potential Problem Area? ☐Yes ☒No
(If needed, explain on reverse side.)
Transect ID: 1
B

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. *Polygonum amphibium*	100	H	OBL
2.			
3.			
4.			
5.			
6.			
7			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100

Remarks: Abrupt boundary between *Polygonum amphibium* and upland area

HYDROLOGY

- ☐ Recorded Data (Describe in Remarks):
- ☐ Stream, Lake, or Tide Gauge
- ☐ Aerial Photographs
- ☐ Other
- ☐ No Recorded Data Available

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:

- ☐ Inundated
- ☐ Saturated in upper 12 inches
- ☐ Water Marks
- ☒ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):

- ☐ Oxidized root channels in upper 12 inches
- ☐ Water-stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (explain in Remarks)

FIELD OBSERVATIONS:

Depth of Surface Water: N/A (in.)

Depth to Free Water in Pit: -- (in.)

Depth to Saturated Soil -- (in.)

Remarks:

SOILS **

Map Unit Name
(Series and Phase) ______________________________. Drainage Class: ____________________.
Field Observations
Taxonomy (Subgroup): ______________________________ Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.

Hydric Soil Indicators:

____ Histosol
____ Histic Epipedon
____ Sulfidic Odor
____ Aquic Moisture Regime
____ Reducing Conditions
____ Gleyed or Low-Chroma Colors
____ Concretions
____ High Organic Content in Surface Layer in Sandy Soils
____ Organic Streaking in Sandy Soils
____ Listed on Local Hydric Soils List
____ Listed on National Hydric Soils List
X Other (Explain in Remarks)

Remarks:

** Soil assumed, greater than 90% cover by obl HOWEVER, nearby test pits had soil colors of 1) 10 YR 2/2 with 7.5 YR ¾ & 5 YR 4/6 mottles and 2) 10 YR 3/2 with 5 YR 4/6 & 7.5 YR ¾ mottles (both taken at 8" depth)

WETLAND DETERMINATION

	(Circle)		
Hydrophytic Vegetation Present?	[✓ Yes]	No	
Wetland Hydrology Present?	[✓ Yes]	No	
Hydric Soils Present?	[✓ Yes]	No	

(Circle)
Is this Sampling Point Within a Wetland? [✓ Yes] No

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site: Crystal Springs
Date: 7/31/06
Applicant/Owner: SFPUC
County: San Mateo
Investigator: K. Colgate, S. Ebrahim
State: California
Do Normal Circumstances exist on the site? ☒Yes ☐No
Community ID:
Is the site significantly disturbed (Atypical Situation)? ☐Yes ☒No
Plot ID: WET111
Is the area a potential Problem Area? ☐Yes ☒No
(If needed, explain on reverse side.)
Transect ID: 2
A

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. Hordeum marinum spp. gussoneanum		H	NL
2. Avena fatua		H	NL
3. Centaurea solstitialis		H	NL
4.			
5.			
6.			
7			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 0

Remarks:

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
☐ Stream, Lake, or Tide Gauge
☐ Aerial Photographs
☐ Other
☐ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water: N/A (in.)

Depth to Free Water in Pit: -- (in.)

Depth to Saturated Soil -- (in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:
☐ Inundated
☐ Saturated in upper 12 inches
☐ Water Marks
☐ Drift Lines
☐ Sediment Deposits
☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
☐ Oxidized root channels in upper 12 inches
☐ Water-stained Leaves
☐ Local Soil Survey Data
☐ FAC-Neutral Test
☐ Other (explain in Remarks)

Remarks:

SOILS

Map Unit Name
(Series and Phase) ______________________________. Drainage Class: ________________.
Field Observations
Taxonomy (Subgroup): ______________________________ Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.

Hydric Soil Indicators:

- ____ Histosol
- ____ Histic Epipedon
- ____ Sulfidic Odor
- ____ Aquic Moisture Regime
- ____ Reducing Conditions
- ____ Gleyed or Low-Chroma Colors
- ____ Concretions
- ____ High Organic Content in Surface Layer in Sandy Soils
- ____ Organic Streaking in Sandy Soils
- ____ Listed on Local Hydric Soils List
- ____ Listed on National Hydric Soils List
- ____ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

(Circle)
Hydrophytic Vegetation Present? Yes [✓ No]
Wetland Hydrology Present? Yes No
Hydric Soils Present? Yes No

(Circle)
Is this Sampling Point Within a Wetland? Yes [✓ No]

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site: Crystal Springs
Date: 07/31/06
Applicant/Owner: SFPUC
County: San Mateo
Investigator: K. Colgate, S. Ebrahim
State: California
Do Normal Circumstances exist on the site? ☒Yes ☐No
Community ID:
Is the site significantly disturbed (Atypical Situation)? ☐Yes ☒No
Plot ID: WET111
Is the area a potential Problem Area? ☐Yes ☒No
(If needed, explain on reverse side.)
Transect ID: 2
B

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. *Lythrum tribracteatum*		H	OBL
2. *Stachys bullata*		H	NL
3. *Navarretia pubescens*		H	NL
4. *Gnaphalium palustre*		H	FACW
5. *Juncus mexicanus*		H	FACW
6.			
7			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 60%

Remarks:

HYDROLOGY

- ☐ Recorded Data (Describe in Remarks):
- ☐ Stream, Lake, or Tide Gauge
- ☒ Aerial Photographs
- ☐ Other
- ☐ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water: N/A (in.)

Depth to Free Water in Pit: >12 (in.)

Depth to Saturated Soil >12 (in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:

- ☐ Inundated
- ☐ Saturated in upper 12 inches
- ☐ Water Marks
- ☒ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):

- ☐ Oxidized root channels in upper 12 inches
- ☐ Water-stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (explain in Remarks)

Remarks:

SOILS

Map Unit Name
(Series and Phase) ______________________________. Drainage Class: ______________.
Field Observations
Taxonomy (Subgroup): ______________________________ Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
8"		10 YR 2/1			

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
___ Aquic Moisture Regime
___ Reducing Conditions
X Gleyed or Low-Chroma Colors

___ Concretions
___ High Organic Content in Surface Layer in Sandy Soils
___ Organic Streaking in Sandy Soils
___ Listed on Local Hydric Soils List
___ Listed on National Hydric Soils List
___ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

(Circle)
Hydrophytic Vegetation Present? [✓ Yes] No
Wetland Hydrology Present? [✓ Yes] No
Hydric Soils Present? [✓ Yes] No

(Circle)
Is this Sampling Point Within a Wetland? [✓ Yes] No

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site: Crystal Springs
Date: 7/31/06
Applicant/Owner: SFPUC
County: San Mateo
Investigator: K. Colgate, S. Ebrahim
State: California
Do Normal Circumstances exist on the site? ☒Yes ☐No
Community ID:
Is the site significantly disturbed (Atypical Situation)? ☐Yes ☒No
Plot ID: WET111
Is the area a potential Problem Area? ☐Yes ☒No
(If needed, explain on reverse side.)
Transect ID: 3
A

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. *Avena fatua*		H	NL
2. *Hordeum marinum* ssp. *gussoneanum*		H	NL
3.			
4.			
5.			
6.			
7			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 0

Remarks:

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
☐ Stream, Lake, or Tide Gauge
☐ Aerial Photographs
☐ Other
☐ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water: N/A (in.)

Depth to Free Water in Pit: -- (in.)

Depth to Saturated Soil -- (in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:
☐ Inundated
☐ Saturated in upper 12 inches
☐ Water Marks
☐ Drift Lines
☐ Sediment Deposits
☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
☐ Oxidized root channels in upper 12 inches
☐ Water-stained Leaves
☐ Local Soil Survey Data
☐ FAC-Neutral Test
☐ Other (explain in Remarks)

Remarks:

SOILS

Map Unit Name
(Series and Phase) ______________________. Drainage Class: ______________.
Field Observations
Taxonomy (Subgroup): ______________________ Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.

Hydric Soil Indicators:

- ____ Histosol
- ____ Histic Epipedon
- ____ Sulfidic Odor
- ____ Aquic Moisture Regime
- ____ Reducing Conditions
- ____ Gleyed or Low-Chroma Colors
- ____ Concretions
- ____ High Organic Content in Surface Layer in Sandy Soils
- ____ Organic Streaking in Sandy Soils
- ____ Listed on Local Hydric Soils List
- ____ Listed on National Hydric Soils List
- ____ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

	(Circle)	
Hydrophytic Vegetation Present?	Yes	[✓ No]
Wetland Hydrology Present?	Yes	No
Hydric Soils Present?	Yes	No

(Circle)
Is this Sampling Point Within a Wetland? Yes [✓ No]

Remarks:

Wet111_TR4_PitA.doc

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site: Crystal Springs
Applicant/Owner: SFPUC
Investigator: K. Colgate, S. Ebrahim
Do Normal Circumstances exist on the site? ☒Yes ☐No
Is the site significantly disturbed (Atypical Situation)? ☐Yes ☒No
Is the area a potential Problem Area? ☐Yes ☒No
(If needed, explain on reverse side.)

Date: 07/31/06
County: San Mateo
State: California
Community ID:
Plot ID: WET111
Transect ID: 4
A

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. *Carduus pycnocephalus*		H	NL
2. *Avena fatua*		H	NL
3. *Baccharis pilularis*		S	NL
4. *Quercus agrifolia*		T	NL
5.			
6.			
7			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 0

Remarks:

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
☐ Stream, Lake, or Tide Gauge
☐ Aerial Photographs
☐ Other
☐ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water: N/A (in.)

Depth to Free Water in Pit: -- (in.)

Depth to Saturated Soil -- (in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:
☐ Inundated
☐ Saturated in upper 12 inches
☐ Water Marks
☐ Drift Lines
☐ Sediment Deposits
☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
☐ Oxidized root channels in upper 12 inches
☐ Water-stained Leaves
☐ Local Soil Survey Data
☐ FAC-Neutral Test
☐ Other (explain in Remarks)

Remarks:

SOILS

Map Unit Name
(Series and Phase) ______________________. Drainage Class: ____________.
Field Observations
Taxonomy (Subgroup): ______________________ Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.

Hydric Soil Indicators:

- ___ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- ___ Aquic Moisture Regime
- ___ Reducing Conditions
- ___ Gleyed or Low-Chroma Colors
- ___ Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- ___ Listed on Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- ___ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

	(Circle)	
Hydrophytic Vegetation Present?	Yes	[✓ No]
Wetland Hydrology Present?	Yes	No
Hydric Soils Present?	Yes	No

(Circle)
Is this Sampling Point Within a Wetland? Yes [✓ No]

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site: Crystal Springs
Date: 07/31/06
Applicant/Owner: SFPUC
County: San Mateo
Investigator: K. Colgate, S. Ebrahim
State: California
Do Normal Circumstances exist on the site? ☒Yes ☐No
Community ID:
Is the site significantly disturbed (Atypical Situation)? ☐Yes ☒No
Plot ID: WET111
Is the area a potential Problem Area? ☐Yes ☒No
(If needed, explain on reverse side.)
Transect ID: 4
B

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. Cyperus eragrostis	100	H	FACW
2. Salix exigua	100	T	OBL
3.			
4.			
5.			
6.			
7			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100

Remarks:

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
☐ Stream, Lake, or Tide Gauge
☒ Aerial Photographs
☐ Other
☐ No Recorded Data Available

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:
☐ Inundated
☐ Saturated in upper 12 inches
☐ Water Marks
☒ Drift Lines
☐ Sediment Deposits
☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
☐ Oxidized root channels in upper 12 inches
☐ Water-stained Leaves
☐ Local Soil Survey Data
☐ FAC-Neutral Test
☐ Other (explain in Remarks)

FIELD OBSERVATIONS:

Depth of Surface Water:	N/A	(in.)
Depth to Free Water in Pit:	>12	(in.)
Depth to Saturated Soil	>12	(in.)

Remarks:

SOILS

Map Unit Name
(Series and Phase) ______________________. Drainage Class: ______________.
Field Observations
Taxonomy (Subgroup): ______________________ Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
8"		10 YR 3/2	7.5 YR 4/6		

Hydric Soil Indicators:

- ___ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- ___ Aquic Moisture Regime
- ___ Reducing Conditions
- X Gleyed or Low-Chroma Colors
- ___ Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- ___ Listed on Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- ___ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

(Circle)
Hydrophytic Vegetation Present? [✓ Yes] No
Wetland Hydrology Present? [✓ Yes] No
Hydric Soils Present? [✓ Yes] No

(Circle)
Is this Sampling Point Within a Wetland? [✓ Yes] No

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site:	Crystal Springs Reservoir – Spillway Pond	Date:	August 2, 2006
Applicant/Owner:		County:	
Investigator:	K.Colgate, S.Ebrahim	State:	California
Do Normal Circumstances exist on the site?	☒ Yes ☐ No	Community ID:	
Is the site significantly disturbed (Atypical Situation)?	☐ Yes ☒ No	Plot ID:	SW WET1
Is the area a potential Problem Area? (If needed, explain on reverse side.)	☐ Yes ☒ No	Transect ID:	1-A

VEGETATION

Dominant Plant Species	Relative % Cover	Stratum	Indicator
1. *Vinca major*	55	S	NL (UPL)
2. *Toxicodendron diversilobum*	40	S	NL (UPL)
3. *Quercus agrifolia*	100	T	NL (UPL)
4.			
5.			
6.			
7.			
8.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 0%

Remarks: Other species include *Rubus ursinus, Marah* spp.

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
☐ Stream, Lake, or Tide Gauge
☐ Aerial Photographs
☐ Other
☐ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water: N/A (in.)

Depth to Free Water in Pit: _____ (in.)

Depth to Saturated Soil _____ (in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:
☐ Inundated
☐ Saturated in upper 12 inches
☐ Water Marks
☐ Drift Lines
☐ Sediment Deposits
☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
☐ Oxidized root channels in upper 12 inches
☐ Water-stained Leaves
☐ Local Soil Survey Data
☐ FAC-Neutral Test
☐ Other (explain in Remarks)

Remarks: N/A

SOILS

Map Unit Name
(Series and Phase) ______________________________

Drainage Class: ______________
Field Observations
Confirm Mapped Type? Yes No

Taxonomy (Subgroup): ______________________________

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.

Hydric Soil Indicators:

- ___ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- ___ Aquic Moisture Regime
- ___ Reducing Conditions
- ___ Gleyed or Low-Chroma Colors
- ___ Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- ___ Listed on Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- ___ Other (Explain in Remarks)

Remarks:

N/A

WETLAND DETERMINATION

Hydrophytic Vegetation Present? Yes [✓ No] (Circle)
Wetland Hydrology Present? Yes No
Hydric Soils Present? Yes No

(Circle)
Is this Sampling Point Within a Wetland? Yes [✓ No]

Remarks:

Pit location: 18 ft at N65°W from Piezometer "B"

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site: Crystal Springs Reservoir – Spillway Pond
Date: August 2, 2006
Applicant/Owner:
County:
Investigator: K.Colgate, S.Ebrahim
State: California
Do Normal Circumstances exist on the site? ☒ Yes ☐ No
Community ID:
Is the site significantly disturbed (Atypical Situation)? ☐ Yes ☒ No
Plot ID: SW WET1
Is the area a potential Problem Area? ☐ Yes ☒ No
Transect ID: 1-B
(If needed, explain on reverse side.)

VEGETATION

Dominant Plant Species	Relative % Cover	Stratum	Indicator
1. *Vinca major*	60	S	NL
2. *Rubus ursinus*	40	S	NL
3. *Salix lasiolepis*	100	T	FACW
4.			
5.			
6.			
7.			
8.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 33

Remarks: Other species include *Toxicodendron diversilobum* and *Oenanthe sarmentosa*

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
☐ Stream, Lake, or Tide Gauge
☒ Aerial Photographs
☐ Other
☐ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water: N/A (in.)

Depth to Free Water in Pit: 8 (in.)

Depth to Saturated Soil 12 (in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:
☐ Inundated
☒ Saturated in upper 12 inches
☐ Water Marks
☐ Drift Lines
☐ Sediment Deposits
☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
☐ Oxidized root channels in upper 12 inches
☐ Water-stained Leaves
☐ Local Soil Survey Data
☐ FAC-Neutral Test
☐ Other (explain in Remarks)

Remarks: ediment on leaves

SOILS

Map Unit Name
(Series and Phase) ______________________
Drainage Class: ______________
Taxonomy (Subgroup): ______________________
Field Observations
Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-8		Fill			
8-10		5 YR 3/1	--	--	sandy

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
___ Aquic Moisture Regime
___ Reducing Conditions
X Gleyed or Low-Chroma Colors

___ Concretions
___ High Organic Content in Surface Layer in Sandy Soils
___ Organic Streaking in Sandy Soils
___ Listed on Local Hydric Soils List
___ Listed on National Hydric Soils List
___ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present? Yes [✓ No] (Circle)
Wetland Hydrology Present? [✓ Yes] No
Hydric Soils Present? [✓ Yes] No

(Circle)
Is this Sampling Point Within a Wetland? Yes [✓ No]

Remarks:

Pit location: 10.5' ft at S65°W from Piezometer B

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site: Crystal Springs Reservoir – Spillway Pond
Date: August 2, 2006
Applicant/Owner:
County:
Investigator: K.Colgate, S.Ebrahim
State: California
Do Normal Circumstances exist on the site? ☒ Yes ☐ No
Community ID:
Is the site significantly disturbed (Atypical Situation)? ☐ Yes ☒ No
Plot ID: SW Wet1
Is the area a potential Problem Area? ☐ Yes ☒ No
Transect ID: 2-A
(If needed, explain on reverse side.)

VEGETATION

Dominant Plant Species	Relative % Cover	Stratum	Indicator
1. *Rubus ursinus*	65	S	NL
2. *Toxicodendron diversilobum*	35	S	NL
3. *Acer macrophyllum*	65	T	FAC
4. *Quercus agrifolia*	35	T	NL
5.			
6.			
7.			
8.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): **25%**

Remarks:

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
☐ Stream, Lake, or Tide Gauge
☐ Aerial Photographs
☐ Other
☐ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water: N/A (in.)

Depth to Free Water in Pit: N/A (in.)

Depth to Saturated Soil N/A (in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:
☐ Inundated
☐ Saturated in upper 12 inches
☐ Water Marks
☐ Drift Lines
☐ Sediment Deposits
☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
☐ Oxidized root channels in upper 12 inches
☐ Water-stained Leaves
☐ Local Soil Survey Data
☐ FAC-Neutral Test
☐ Other (explain in Remarks)

Remarks:

SOILS

Map Unit Name
(Series and Phase) ____________________

Taxonomy (Subgroup): ____________________

Drainage Class: ____________________
Field Observations
Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
N A					

Hydric Soil Indicators:

- ____ Histosol
- ____ Histic Epipedon
- ____ Sulfidic Odor
- ____ Aquic Moisture Regime
- ____ Reducing Conditions
- ____ Gleyed or Low-Chroma Colors
- ____ Concretions
- ____ High Organic Content in Surface Layer in Sandy Soils
- ____ Organic Streaking in Sandy Soils
- ____ Listed on Local Hydric Soils List
- ____ Listed on National Hydric Soils List
- ____ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present? Yes [✓ No] (Circle)
Wetland Hydrology Present? Yes No
Hydric Soils Present? Yes No

(Circle)
Is this Sampling Point Within a Wetland? Yes [✓ No]

Remarks:

Cobbly slope covered with soil and litter; boundary between wetland/non-wetland abrubt.
Location of pit: 23.5 ft at S95°E from Piezometer A

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site: Crystal Springs Reservoir – Spillway Pond
Date: August 2, 2006
Applicant/Owner:
County:
Investigator: K.Colgate, S.Ebrahim
State: California
Do Normal Circumstances exist on the site? ☒ Yes ☐ No
Community ID:
Is the site significantly disturbed (Atypical Situation)? ☐ Yes ☒ No
Plot ID: SW Wet1
Is the area a potential Problem Area? ☐ Yes ☒ No
(If needed, explain on reverse side.)
Transect ID: 2-B

VEGETATION

Dominant Plant Species	Relative % Cover	Stratum	Indicator
1. *Polygonum punctatum*	20	H	OBL
2. *Oenanthe sarmentosa*	70	H	OBL
3. *Toxicodendron diversilobum*	50	S	NL
4. *Rubus ursinus*	50	S	NL
5. *Salix lucida*	100	T	NI (FACW, FACW+)
6.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): **50%***

Remarks: * Considering this site as meeting hydrophytic vegetation criteria 1) *Salix lucida* is FACW to FACW+ in national status, and FACW for California in 1996 Regional Summary, 2) other species in community are OBL to FACW- (*Typha angustifolia, Rumex crispus, Mentha pulegium, Cyperus eragrostis*), and 3) both *Toxicodendron diversilobum* and *Rubus ursinus* are rooted oustide the community, with runners entering community.

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
☐ Stream, Lake, or Tide Gauge
☒ Aerial Photographs
☐ Other
☐ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water: N/A (in.)

Depth to Free Water in Pit: > 16 (in.)

Depth to Saturated Soil 10 (in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:
☐ Inundated
☒ Saturated in upper 12 inches
☐ Water Marks
☐ Drift Lines
☒ Sediment Deposits
☒ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
☐ Oxidized root channels in upper 12 inches
☒ Water-stained Leaves
☐ Local Soil Survey Data
☐ FAC-Neutral Test
☐ Other (explain in Remarks)

Remarks:

SOILS

Map Unit Name
(Series and Phase) ____________________
Taxonomy (Subgroup): ____________________

Drainage Class: ____________________
Field Observations
Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-6		10 YR 3/1	--	--	clayey
6-16		10 YR 3/2	5 YR 4/6	Moderate/high	sandy

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
___ Aquic Moisture Regime
___ Reducing Conditions
_X_ Gleyed or Low-Chroma Colors

___ Concretions
___ High Organic Content in Surface Layer in Sandy Soils
___ Organic Streaking in Sandy Soils
___ Listed on Local Hydric Soils List
___ Listed on National Hydric Soils List
___ Other (Explain in Remarks)

Remarks:

Streaks of 5 YR 3/1 included in soil

WETLAND DETERMINATION

Hydrophytic Vegetation Present? [✓ Yes] No (Circle)
Wetland Hydrology Present? [✓ Yes] No
Hydric Soils Present? [✓ Yes] No

(Circle)
Is this Sampling Point Within a Wetland? [✓ Yes] No

Remarks:

Location of pit SW 02-B: 32 ft N62°E Piezometer A

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 CoE WETLANDS DELINEATION MANUAL)

Project/Site: Crystal Springs Reservoir – Spillway Pond
Applicant/Owner:
Investigator: K.Colgate, S.Ebrahim
Do Normal Circumstances exist on the site? ☒ Yes ☐ No
Is the site significantly disturbed (Atypical Situation)? ☐ Yes ☒ No
Is the area a potential Problem Area? ☐ Yes ☒ No
(If needed, explain on reverse side.)

Date: August 2, 2006
County:
State: California
Community ID:
Plot ID: SW Wet1
Transect ID: 3-A

VEGETATION

Dominant Plant Species	Relative % Cover	Stratum	Indicator
1. *Rubus ursinus*	25	S	NL
2. *Baccharis pilularis*	25	S	NL
3. *Toxicodendron diversilobum*	15	S	NL
4. *Rubus parviflorus*	15	S	FAC+
5. *Heteromeles arbutifolia*	15	S	NL
6. *Quercus agrifolia*	50	T	NL
7. *Umbellularia californica*	30	T	FAC
8.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 29%

Remarks:

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
☐ Stream, Lake, or Tide Gauge
☐ Aerial Photographs
☐ Other
☐ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water: ______(in.)

Depth to Free Water in Pit: ______(in.)

Depth to Saturated Soil ______(in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:
☐ Inundated
☐ Saturated in upper 12 inches
☐ Water Marks
☐ Drift Lines
☐ Sediment Deposits
☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
☐ Oxidized root channels in upper 12 inches
☐ Water-stained Leaves
☐ Local Soil Survey Data
☐ FAC-Neutral Test
☐ Other (explain in Remarks)

Remarks: N/A

SOILS

Map Unit Name
(Series and Phase) ______________________________

Drainage Class: ______________

Field Observations
Confirm Mapped Type? Yes No

Taxonomy (Subgroup): ______________________________

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.

Hydric Soil Indicators:

____ Histosol
____ Histic Epipedon
____ Sulfidic Odor
____ Aquic Moisture Regime
____ Reducing Conditions
____ Gleyed or Low-Chroma Colors

____ Concretions
____ High Organic Content in Surface Layer in Sandy Soils
____ Organic Streaking in Sandy Soils
____ Listed on Local Hydric Soils List
____ Listed on National Hydric Soils List
____ Other (Explain in Remarks)

Remarks:
N/A

WETLAND DETERMINATION

Hydrophytic Vegetation Present? Yes [✓ No] (Circle)
Wetland Hydrology Present? Yes No
Hydric Soils Present? Yes No

(Circle)
Is this Sampling Point Within a Wetland? Yes [✓ No]

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site:	Crystal Springs Reservoir – Spillway Pond	Date:	August 2, 2006
Applicant/Owner:		County:	
Investigator:	K.Colgate, S.Ebrahim	State:	California
Do Normal Circumstances exist on the site?	☒ Yes ☐ No	Community ID:	
Is the site significantly disturbed (Atypical Situation)?	☐ Yes ☒ No	Plot ID:	SW Wet1
Is the area a potential Problem Area? (If needed, explain on reverse side.)	☐ Yes ☒ No	Transect ID:	3-B

VEGETATION

Dominant Plant Species	Relative % Cover	Stratum	Indicator
1. *Alisma plantago-aquatica*		H	OBL
2. *Typha latifolia*		H	OBL
3. *Cyperus eragrostis*		H	FACW
4. *Cornus sericea*		S	NL
5. *Salix lasioleps*		T	FACW
6.			
7.			
8.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): **> or = to 80%**

Remarks:

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
☐ Stream, Lake, or Tide Gauge
☒ Aerial Photographs
☐ Other
☐ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water: 6 (in.)

Depth to Free Water in Pit: N/A (in.)

Depth to Saturated Soil: N/A (in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:
☒ Inundated
☐ Saturated in upper 12 inches
☐ Water Marks
☐ Drift Lines
☐ Sediment Deposits
☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
☐ Oxidized root channels in upper 12 inches
☐ Water-stained Leaves
☐ Local Soil Survey Data
☐ FAC-Neutral Test
☐ Other (explain in Remarks)

Remarks:

SOILS

Map Unit Name
(Series and Phase) ______________________________

Taxonomy (Subgroup): ______________________________

Drainage Class: ____________________
Field Observations
Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
_x_ Aquic Moisture Regime
___ Reducing Conditions
___ Gleyed or Low-Chroma Colors
___ Concretions
___ High Organic Content in Surface Layer in Sandy Soils
___ Organic Streaking in Sandy Soils
___ Listed on Local Hydric Soils List
___ Listed on National Hydric Soils List
___ Other (Explain in Remarks)

Remarks:
N/A

WETLAND DETERMINATION

Hydrophytic Vegetation Present? [✓ Yes] No (Circle)
Wetland Hydrology Present? [✓ Yes] No
Hydric Soils Present? [✓ Yes] No

(Circle)
Is this Sampling Point Within a Wetland? [✓ Yes] No

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site: Crystal Springs Reservoir – Spillway Pond
Date: August 2, 2006
Applicant/Owner:
County:
Investigator: K.Colgate, S.Ebrahim
State: California
Do Normal Circumstances exist on the site? ☒ Yes ☐ No
Community ID:
Is the site significantly disturbed (Atypical Situation)? ☐ Yes ☒ No
Plot ID: SW Wet2
Is the area a potential Problem Area? ☐ Yes ☒ No
Transect ID: 1-A
(If needed, explain on reverse side.)

VEGETATION

Dominant Plant Species	Relative % Cover	Stratum	Indicator
1. *Heteromeles arbutifolia*		S	NL
2. *Toxicodendron diverislobum*		S	NL
3. *Rubus ursinus*		S	NL
4. *Quercus agrifolia*		T	NL
5. *Umbellularia californica*		T	FAC
6.			
7.			
8.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): **33%**

Remarks:

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
☐ Stream, Lake, or Tide Gauge
☐ Aerial Photographs
☐ Other
☐ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water: ________(in.)

Depth to Free Water in Pit: ________(in.)

Depth to Saturated Soil ________(in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:
☐ Inundated
☐ Saturated in upper 12 inches
☐ Water Marks
☐ Drift Lines
☐ Sediment Deposits
☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
☐ Oxidized root channels in upper 12 inches
☐ Water-stained Leaves
☐ Local Soil Survey Data
☐ FAC-Neutral Test
☐ Other (explain in Remarks)

Remarks: N/A

SOILS

Map Unit Name
(Series and Phase) ______
Taxonomy (Subgroup): ______

Drainage Class: ______
Field Observations
Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.

Hydric Soil Indicators:

- ___ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- ___ Aquic Moisture Regime
- ___ Reducing Conditions
- ___ Gleyed or Low-Chroma Colors
- ___ Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- ___ Listed on Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- ___ Other (Explain in Remarks)

Remarks:
N/A

WETLAND DETERMINATION

Hydrophytic Vegetation Present? Yes [✓ No] (Circle)
Wetland Hydrology Present? Yes No
Hydric Soils Present? Yes No

(Circle)
Is this Sampling Point Within a Wetland? Yes [✓ No]

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site: Potential Mitigation Areas - Adjacent to Crystal Springs Reservoir
Date: 6/9/07
Applicant/Owner: SFPUC
County: San Mateo
Investigator: Keven Colgate/Allison Pruett
State: California
Do Normal Circumstances exist on the site? ☐Yes ☒No
Community ID: Freshwater Marsh
Is the site significantly disturbed (Atypical Situation)? ☒Yes ☐No
Plot ID: PM WET 1
Is the area a potential Problem Area? ☒Yes ☐No
(If needed, explain on reverse side.)
Transect ID: TR1 - PIT A

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. *Typha domingensis*	100	HERB	OBL
2.			
3.			
4.			
5.			
6.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100%

Remarks: Pit A located in an area dominated by 100 % cattail.

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
☐ Stream, Lake, or Tide Gauge
☒ Aerial Photographs
☐ Other
☒ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water: 2 (in.)
Depth to Free Water in Pit: 0 (in.)
Depth to Saturated Soil 0 (in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:
☒ Inundated
☒ Saturated in upper 12 inches
☒ Water Marks
☐ Drift Lines
☐ Sediment Deposits
☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
☐ Oxidized root channels in upper 12 inches
☐ Water-stained Leaves
☐ Local Soil Survey Data
☐ FAC-Neutral Test
☐ Other (explain in Remarks)

Remarks: Pit is inundated.

PM WET 1_TR1_ PIT A

SOILS

Map Unit Name
(Series and Phase) ______________________. Drawing Class: ______________.
Field Observations
Taxonomy (Subgroup): ______________________ Confirm Mapped Type? Yes [✓ No]

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-6	-	NA	NA	NA	water, roots, silt
6-8	-	NA	NA	NA	rock layer

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
___ Aquic Moisture Regime
_X_ Reducing Conditions
_X_ Gleyed or Low-Chroma Colors

___ Concretions
___ High Organic Content in Surface Layer in Sandy Soils
___ Organic Streaking in Sandy Soils
___ Listed on Local Hydric Soils List
___ Listed on National Hydric Soils List
___ Other (Explain in Remarks)

Remarks:
Pit is totally inundated with water. No mineral soil is collectable, only a thin, watery black muck and a thick mass of Typha roots. Hard rock layer at approximately 8 inches. Water is a low chroma color, possibly gleyed. Black muck/organic streaking around root mass.

WETLAND DETERMINATION

(Circle)
Hydrophytic Vegetation Present? [✓ Yes] No
Wetland Hydrology Present? [✓ Yes] No
Hydric Soils Present? Yes [✓ No]

(Circle)
Is this Sampling Point Within a Wetland? Yes [✓ No]

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site: Potential Mitigation Areas - Adjacent to Crystal Springs Reservoir

Date: 6/9/07

Applicant/Owner: SFPUC

County: San Mateo

Investigator: Keven Colgate/Allison Pruett

State: California

Do Normal Circumstances exist on the site? ☐Yes ☒No

Community ID: Freshwater Marsh/Riparian

Is the site significantly disturbed (Atypical Situation)? ☒Yes ☐No

Plot ID: PM WET 1

Is the area a potential Problem Area? ☒Yes ☐No
(If needed, explain on reverse side.)

Transect ID: TR1 - PIT B

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. *Typha domingensis*	40	HERB	OBL
2. *Scirpus cernuus*	40	HERB	OBL
3. *Salix lasiolepis*	100	SHRUB	FACW
4. *Cortaderia* sp.	10	HERB	NL
5. *Juncus patens*	10	HERB	FAC
6.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100%

Remarks: Pit B located on edge of Typha community. Cover is dominated by Typha/Scirpus/Salix - other species are only occasional.

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
☐ Stream, Lake, or Tide Gauge
☒ Aerial Photographs
☐ Other
☒ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water: NA (in.)

Depth to Free Water in Pit: 4 (in.)

Depth to Saturated Soil 0 (in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:

☐ Inundated
☒ Saturated in upper 12 inches
☒ Water Marks
☐ Drift Lines
☐ Sediment Deposits
☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):

☐ Oxidized root channels in upper 12 inches
☐ Water-stained Leaves
☐ Local Soil Survey Data
☐ FAC-Neutral Test
☐ Other (explain in Remarks)

Remarks: Pit quickly filled with water.

PM WET 1_TR1_ PIT B

SOILS

Map Unit Name
(Series and Phase) ______________________.

Taxonomy (Subgroup): ______________________

Drainage Class: ______________________.
Field Observations
Confirm Mapped Type? Yes [✓ No]

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-3	-	7.5 YR 3/1	NA	NA	silty clay
3-7	-	7.5 YR 3/1	NA	NA	coarse sand, gravel, silty clay
7-?	-	?	NA	NA	rock layer

Hydric Soil Indicators:

- ____ Histosol
- ____ Histic Epipedon
- ____ Sulfidic Odor
- ____ Aquic Moisture Regime
- X Reducing Conditions
- X Gleyed or Low-Chroma Colors
- ____ Concretions
- ____ High Organic Content in Surface Layer in Sandy Soils
- ____ Organic Streaking in Sandy Soils
- ____ Listed on Local Hydric Soils List
- ____ Listed on National Hydric Soils List
- ____ Other (Explain in Remarks)

Remarks:
Rock layer at approximately 7 inches, hydric soils above 7 inches.

WETLAND DETERMINATION

	(Circle)	
Hydrophytic Vegetation Present?	[✓ Yes]	No
Wetland Hydrology Present?	[✓ Yes]	No
Hydric Soils Present?	Yes	[✓ No]

(Circle)
Is this Sampling Point Within a Wetland? Yes [✓ No]

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site:	Potential Mitigation Areas - adjacent to Crystal Springs Reservoir	Date:	6/9/07
Applicant/Owner:	SFPUC	County:	San Mateo
Investigator:	Keven Colgate/Allison Pruett	State:	California
Do Normal Circumstances exist on the site?	☐Yes ☒No	Community ID:	Freshwater Marsh/Riparian
Is the site significantly disturbed (Atypical Situation)?	☒Yes ☐No	Plot ID:	PM WET 1
Is the area a potential Problem Area? (If needed, explain on reverse side.)	☒Yes ☐No	Transect ID:	TR1 - PIT C

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. *Holcus lanatus*	95	HERB	FAC
2.			
3.			
4.			
5.			
6.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100%

Remarks: Also present: *Picris echioides* (FAC+), *Lotus corniculatus* (FAC), *Cyperus eragrostis* (FACW), *Salix lasiolepis* (FACW), all less than 5% cover.

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
☐ Stream, Lake, or Tide Gauge
☒ Aerial Photographs
☐ Other
☒ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water: ___NA___ (in.)

Depth to Free Water in Pit: ___NA ___ (in.)

Depth to Saturated Soil ___NA ___ (in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:

☐ Inundated
☐ Saturated in upper 12 inches
☒ Water Marks
☐ Drift Lines
☐ Sediment Deposits
☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):

☒ Oxidized root channels in upper 12 inches
☐ Water-stained Leaves
☐ Local Soil Survey Data
☒ FAC-Neutral Test
☐ Other (explain in Remarks)

Remarks: May receive groundwater from adjacent inundated areas. Soil is damp, but not saturated.

PM WET 1_TR1_ PIT C

SOILS

Map Unit Name
(Series and Phase) ______________________. Drainage Class: ______________.
Field Observations
Taxonomy (Subgroup): ______________________ Confirm Mapped Type? Yes [✓ No]

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-7	-	7.5 YR 4/2	NA	NA	coarse silty sand
7-?	-	NA	NA	NA	rock

Hydric Soil Indicators:

___	Histosol	___	Concretions
___	Histic Epipedon	___	High Organic Content in Surface Layer in Sandy Soils
___	Sulfidic Odor	___	Organic Streaking in Sandy Soils
___	Aquic Moisture Regime	___	Listed on Local Hydric Soils List
X	Reducing Conditions	___	Listed on National Hydric Soils List
X	Gleyed or Low-Chroma Colors	___	Other (Explain in Remarks)

Remarks:
Rock layer at approximately 7 inches. No hydric indicators above rock layer.

WETLAND DETERMINATION

	(Circle)			(Circle)
Hydrophytic Vegetation Present?	[✓ Yes]	No		
Wetland Hydrology Present?	[✓ Yes]	No		
Hydric Soils Present?	Yes	[✓ No]	Is this Sampling Point Within a Wetland?	Yes [✓ No]

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site: Potential Mitigation Areas - Adjacent to Crystal Springs Reservoir

Date: 6/9/07

Applicant/Owner: SFPUC

County: San Mateo

Investigator: Keven Colgate/Allison Pruett

State: California

Do Normal Circumstances exist on the site? ☐Yes ☒No

Community ID: Vernal Wetland/Non-Native Grassland

Is the site significantly disturbed (Atypical Situation)? ☒Yes ☐No

Plot ID: PM WET 1

Is the area a potential Problem Area? ☒Yes ☐No
(If needed, explain on reverse side.)

Transect ID: TR1 - PIT D

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. *Hordeum marinum* ssp. *gussoneanum*	50	HERB	FAC
2. *Lotus corniculatus*	40	HERB	FAC
3. *Plantago coronopus*	10	HERB	FAC
4.			
5.			
6.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100%

Remarks: Also present: *Bellardia trixago* (NL) and *Trifolium campestre* (NL) at less than 1% cover.

HYDROLOGY

- ☐ Recorded Data (Describe in Remarks):
- ☐ Stream, Lake, or Tide Gauge
- ☒ Aerial Photographs
- ☐ Other
- ☒ No Recorded Data Available

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:

- ☐ Inundated
- ☐ Saturated in upper 12 inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):

- ☒ Oxidized root channels in upper 12 inches
- ☐ Water-stained Leaves
- ☐ Local Soil Survey Data
- ☒ FAC-Neutral Test
- ☐ Other (explain in Remarks)

FIELD OBSERVATIONS:

Depth of Surface Water: ___NA___ (in.)

Depth to Free Water in Pit: ___NA ___ (in.)

Depth to Saturated Soil ___NA ___ (in.)

Remarks: Totally dry. No hydrology. Area is above the low ponded area.

PM WET 1_TR1_ PIT D

SOILS

Map Unit Name
(Series and Phase) ______________________. Drainage Class: ______________.
Field Observations
Taxonomy (Subgroup): ______________________ Confirm Mapped Type? Yes [✓ No]

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-9	-	Gley1 4/10Y	NA	NA	silty gravel
9-?	-	NA	NA	NA	rock

Hydric Soil Indicators:

- ____ Histosol
- ____ Histic Epipedon
- ____ Sulfidic Odor
- ____ Aquic Moisture Regime
- ____ Reducing Conditions
- ____ Gleyed or Low-Chroma Colors
- ____ Concretions
- ____ High Organic Content in Surface Layer in Sandy Soils
- ____ Organic Streaking in Sandy Soils
- ____ Listed on Local Hydric Soils List
- ____ Listed on National Hydric Soils List
- ____ Other (Explain in Remarks)

Remarks:
Gleyed color is likely from parent material. 95% gravel, interstitial silt is gleyed. Solid rock layer at approximately 9 inches.

WETLAND DETERMINATION

	(Circle)	
Hydrophytic Vegetation Present?	[✓ Yes]	No
Wetland Hydrology Present?	[✓ Yes]	No
Hydric Soils Present?	Yes	[✓ No]

(Circle)
Is this Sampling Point Within a Wetland? Yes [✓ No]

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site:	Potential Mitigation Areas - Adjacent to Crystal Springs Reservoir	Date:	6/9/07
Applicant/Owner:	SFPUC	County:	San Mateo
Investigator:	Keven Colgate/Allison Pruett	State:	California
Do Normal Circumstances exist on the site?	☐Yes ☒No	Community ID:	Freshwater Marsh
Is the site significantly disturbed (Atypical Situation)?	☒Yes ☐No	Plot ID:	PM WET 1
Is the area a potential Problem Area? (If needed, explain on reverse side.)	☒Yes ☐No	Transect ID:	TR2 - PIT A

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. *Typha domingensis*	100	HERB	OBL
2.			
3.			
4.			
5.			
6.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100 %

Remarks: 100 percent cover by Typha.

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
☐ Stream, Lake, or Tide Gauge
☒ Aerial Photographs
☐ Other
☒ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water: __1___ (in.)

Depth to Free Water in Pit: ___0___ (in.)

Depth to Saturated Soil ___0___ (in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:
☒ Inundated
☒ Saturated in upper 12 inches
☒ Water Marks
☐ Drift Lines
☐ Sediment Deposits
☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
☐ Oxidized root channels in upper 12 inches
☐ Water-stained Leaves
☐ Local Soil Survey Data
☐ FAC-Neutral Test
☐ Other (explain in Remarks)

Remarks: Inundated.

PM WET 1_TR2_ PIT A

SOILS

Map Unit Name
(Series and Phase) ________________________________.

Taxonomy (Subgroup): ________________________________

Drainage Class: ____________________.
Field Observations
Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-4	-	NA	NA	NA	Root Wad
4-8	-	NA	NA	NA	Gravel
8-?		NA	NA	NA	Rock

Hydric Soil Indicators:

____ Histosol
____ Histic Epipedon
____ Sulfidic Odor
____ Aquic Moisture Regime
____ Reducing Conditions
____ Gleyed or Low-Chroma Colors
____ Concretions
____ High Organic Content in Surface Layer in Sandy Soils
____ Organic Streaking in Sandy Soils
____ Listed on Local Hydric Soils List
____ Listed on National Hydric Soils List
____ Other (Explain in Remarks)

Remarks:

Fibrous root mass from 0-4 inches, then gravel. Silty water is low-chroma. Cannot extract any mineral soil in order to check color. Soil assumed based on 100 percent cover by OBL species and inundation.

WETLAND DETERMINATION

(Circle)
Hydrophytic Vegetation Present? [✓ Yes] No
Wetland Hydrology Present? [✓ Yes] No
Hydric Soils Present? [✓ Yes] No

(Circle)
Is this Sampling Point Within a Wetland? [✓ Yes] No

Remarks:

Soil assumed based on 100 percent cover by OBL species and inundation.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site:	Potential Mitigation Areas - Adjacent to Crystal Springs Reservoir	Date:	6/9/07
Applicant/Owner:	SFPUC	County:	San Mateo
Investigator:	Keven Colgate/Allison Pruett	State:	California
Do Normal Circumstances exist on the site?	☐Yes ☒No	Community ID:	Vernal Wetland/ Freshwater Marsh
Is the site significantly disturbed (Atypical Situation)?	☒Yes ☐No	Plot ID:	PM WET 1
Is the area a potential Problem Area? (If needed, explain on reverse side.)	☒Yes ☐No	Transect ID:	TR2 - PIT B

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. *Typha domingensis*	50	HERB	OBL
2. *Scirpus cernuus*	20	HERB	OBL
3. *Epilobium ciliatum*	20	HERB	FACW
4.			
5.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100%

Remarks: Also: *Juncus cf. xiphioides* (OBL), *Polypogen monspiliensis* (FACW+), *Lotus corniculatis* (FAC).

HYDROLOGY

- ☐ Recorded Data (Describe in Remarks):
- ☐ Stream, Lake, or Tide Gauge
- ☒ Aerial Photographs
- ☐ Other
- ☒ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water: __NA__ (in.)

Depth to Free Water in Pit: __NA__ (in.)

Depth to Saturated Soil __NA___ (in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:

- ☐ Inundated
- ☒ Saturated in upper 12 inches
- ☒ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):

- ☐ Oxidized root channels in upper 12 inches
- ☐ Water-stained Leaves
- ☐ Local Soil Survey Data
- ☒ FAC-Neutral Test
- ☐ Other (explain in Remarks)

Remarks: Pit B located in transitional zone between *Typha* stand and Upland/Vernal Wetland community.

PM WET 1_TR2_ PIT B

SOILS

Map Unit Name
(Series and Phase) ______________________. Drainage Class: ______________.
Field Observations
Taxonomy (Subgroup): ______________________ Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-3	-	2.5YR 3/1	NA	NA	Silty clay
3-11	-	Gley 2 6/5B	Gley 1 4/10YR	30%	Clay with gravel
3-11	-	Gley 2 6/5B	2.5 YR 4/8	3%	Clay with gravel
11-?	-	NA	NA	NA	Rock

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
___ Aquic Moisture Regime
___ Reducing Conditions
_X_ Gleyed or Low-Chroma Colors

___ Concretions
___ High Organic Content in Surface Layer in Sandy Soils
___ Organic Streaking in Sandy Soils
___ Listed on Local Hydric Soils List
___ Listed on National Hydric Soils List
___ Other (Explain in Remarks)

Remarks:
Rock layer at 11 inches.

WETLAND DETERMINATION

(Circle)

Hydrophytic Vegetation Present? [✓ Yes] No
Wetland Hydrology Present? [✓ Yes] No
Hydric Soils Present? [✓ Yes] No

(Circle)

Is this Sampling Point Within a Wetland? [✓ Yes] No

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site:	Potential Mitigation Areas - Adjacent to Crystal Springs Reservoir	Date:	6/9/07
Applicant/Owner:	SFPUC	County:	San Mateo
Investigator:	Keven Colgate/Allison Pruett	State:	California
Do Normal Circumstances exist on the site?	☐Yes ☒No	Community ID:	Vernal Wetland/ Non-Native Grassland
Is the site significantly disturbed (Atypical Situation)?	☒Yes ☐No	Plot ID:	PM WET 1
Is the area a potential Problem Area? (If needed, explain on reverse side.)	☒Yes ☐No	Transect ID:	TR2 - PIT C

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. *Polypogon monspeliensis*	30	HERB	FACW+
2. *Phalaris* sp.	20	HERB	FAC-FACU
3. *Lotus corniculatus*	20	HERB	FAC
4. *Cortaderia* sp.	25	HERB	NL
5.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 75%

Remarks: Also: *Sonchus asper* (FAC), *Briza minor* (FACW-), *Picris echoioides* (FAC+) (<5 percent cover). *Briza* approximately 10 percent cover.

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
☐ Stream, Lake, or Tide Gauge
☒ Aerial Photographs
☐ Other
☒ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water: __NA__ (in.)

Depth to Free Water in Pit: __NA__ (in.)

Depth to Saturated Soil __NA___ (in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:

☐ Inundated
☐ Saturated in upper 12 inches
☐ Water Marks
☐ Drift Lines
☐ Sediment Deposits
☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):

☐ Oxidized root channels in upper 12 inches
☐ Water-stained Leaves
☐ Local Soil Survey Data
☐ FAC-Neutral Test
☐ Other (explain in Remarks)

Remarks: Very dry, no hydrology. Evidence of ponding just down slope.

PM WET 1_TR2_ PIT C

SOILS

Map Unit Name
(Series and Phase) ______________________________.

Taxonomy (Subgroup): ______________________________

Drainage Class: ____________________.
Field Observations
Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-5	-	2.5YR 4/3	NA	NA	Silty, coarse sand.
5-?	-	NA	NA	NA	Rock

Hydric Soil Indicators:

____ Histosol
____ Histic Epipedon
____ Sulfidic Odor
____ Aquic Moisture Regime
____ Reducing Conditions
____ Gleyed or Low-Chroma Colors

____ Concretions
____ High Organic Content in Surface Layer in Sandy Soils
____ Organic Streaking in Sandy Soils
____ Listed on Local Hydric Soils List
____ Listed on National Hydric Soils List
____ Other (Explain in Remarks)

Remarks:
Impermeable rock layer at 5 inches.

WETLAND DETERMINATION

(Circle)
Hydrophytic Vegetation Present? [✓ Yes] No
Wetland Hydrology Present? Yes [✓ No]
Hydric Soils Present? Yes [✓ No]

(Circle)
Is this Sampling Point Within a Wetland? Yes [✓ No]

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site: Potential Mitigation Areas - Adjacent to Crystal Springs Reservoir

Date: 6/9/07

Applicant/Owner: SFPUC

County: San Mateo

Investigator: Keven Colgate/Allison Pruett

State: California

Do Normal Circumstances exist on the site? ☐Yes ☒No

Community ID: Riparian

Is the site significantly disturbed (Atypical Situation)? ☒Yes ☐No

Plot ID: PM WET 2

Is the area a potential Problem Area? ☒Yes ☐No
(If needed, explain on reverse side.)

Transect ID: TR1 - PIT A

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. *Salix lasiolepis*	100	TREE	FACW
2. *Rubus ursinus*	25	VINE	FACW+
3.			
4.			
5.			
6.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100 %

Remarks:

HYDROLOGY

- ☐ Recorded Data (Describe in Remarks):
- ☐ Stream, Lake, or Tide Gauge
- ☒ Aerial Photographs
- ☐ Other
- ☒ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water: __NA__ (in.)

Depth to Free Water in Pit: __NA__ (in.)

Depth to Saturated Soil __NA___ (in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:

- ☐ Inundated
- ☐ Saturated in upper 12 inches
- ☒ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):

- ☐ Oxidized root channels in upper 12 inches
- ☒ Water-stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (explain in Remarks)

Remarks: Dry soil – fine powdery silt. Water stained leaves under willows. Evidence of ponding in adjacent open areas – some soil surface cracking. Weak indicators. Hydrology is sketchy at best.

PM WET 2_TR1_ PIT A

SOILS

Map Unit Name
(Series and Phase) ________________________.
Taxonomy (Subgroup): ________________________

Drainage Class: ________________.
Field Observations
Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-16	-	10YR 4/2	NA	NA	Fine silt.

Hydric Soil Indicators:

____ Histosol
____ Histic Epipedon
____ Sulfidic Odor
____ Aquic Moisture Regime
____ Reducing Conditions
____ Gleyed or Low-Chroma Colors
____ Concretions
____ High Organic Content in Surface Layer in Sandy Soils
____ Organic Streaking in Sandy Soils
____ Listed on Local Hydric Soils List
____ Listed on National Hydric Soils List
____ Other (Explain in Remarks)

Remarks:
Uniform silty matrix – no hydric indicators. Earth worms in pit.

WETLAND DETERMINATION

(Circle)
Hydrophytic Vegetation Present? [✓ Yes] No
Wetland Hydrology Present? [✓ Yes] No
Hydric Soils Present? Yes [✓ No]

(Circle)
Is this Sampling Point Within a Wetland? Yes [✓ No]

Remarks:
Man made borrow pit area – berm constructed on east side.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site:	Potential Mitigation Areas - Adjacent to Crystal Springs Reservoir	Date:	6/9/07
Applicant/Owner:	SFPUC	County:	San Mateo
Investigator:	Keven Colgate/Allison Pruett	State:	California
Do Normal Circumstances exist on the site?	☐Yes ☒No	Community ID:	Vernal Wetland/Non-Native Grassland
Is the site significantly disturbed (Atypical Situation)?	☒Yes ☐No	Plot ID:	PM WET 2
Is the area a potential Problem Area? (If needed, explain on reverse side.)	☒Yes ☐No	Transect ID:	TR1 - PIT B

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. *Salix lasiolepis*	70	TREE	FACW
2. *Scirpus cernuus*	20	HERB	OBL
3.			
4.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100 %

Remarks: Open, nearly unvegetated area. *Salix lasiolepis* is adjacent and overhead, *Scirpus cernuus* immediately at pit.

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
☐ Stream, Lake, or Tide Gauge
☒ Aerial Photographs
☐ Other
☒ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water: __NA__ (in.)

Depth to Free Water in Pit: __NA__ (in.)

Depth to Saturated Soil __NA___ (in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:

☐ Inundated
☐ Saturated in upper 12 inches
☒ Water Marks
☒ Drift Lines
☐ Sediment Deposits
☒ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):

☐ Oxidized root channels in upper 12 inches
☐ Water-stained Leaves
☐ Local Soil Survey Data
☐ FAC-Neutral Test
☐ Other (explain in Remarks)

Remarks: Damp silty soil, algal mats hanging from willow branches about 3.5 feet off the ground. Inundation area is indicated by lack of leaves and lack of *Rubus* (Pit A). Algal mat corresponds with vegetation boundary. Some channeling is visible. Area is hydraulically isolated from reservoir.

PM WET 2_TR1_ PIT B

SOILS

Map Unit Name
(Series and Phase) ______________________________.
Drainage Class: ____________________.
Field Observations
Confirm Mapped Type? Yes No
Taxonomy (Subgroup): ______________________________

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-9	-	10YR 4/2	NA	NA	Fine silty clay.
9-16	-	GI 2.5/10YR	NA	NA	Fine silty clay.

Hydric Soil Indicators:

- ___ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- ___ Aquic Moisture Regime
- ___ Reducing Conditions
- X Gleyed or Low-Chroma Colors
- ___ Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- ___ Listed on Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- ___ Other (Explain in Remarks)

Remarks:
Gleyed layers.

WETLAND DETERMINATION

	(Circle)	
Hydrophytic Vegetation Present?	[✓ Yes]	No
Wetland Hydrology Present?	[✓ Yes]	No
Hydric Soils Present?	[✓ Yes]	No

(Circle)
Is this Sampling Point Within a Wetland? [✓ Yes] No

Remarks:

Isolated ponded area - potentially not jurisdictional.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site:	Potential Mitigation Areas - Adjacent to Crystal Springs Reservoir	Date:	6/9/07
Applicant/Owner:	SFPUC	County:	San Mateo
Investigator:	Keven Colgate/Allison Pruett	State:	California
Do Normal Circumstances exist on the site?	☐Yes ☒No	Community ID:	Coastal Sage Scrub/Non-Native Grassland
Is the site significantly disturbed (Atypical Situation)?	☒Yes ☐No	Plot ID:	PM WET 3
Is the area a potential Problem Area? (If needed, explain on reverse side.)	☒Yes ☐No	Transect ID:	TR1 - PIT A

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. *Baccharis pilularis*	100	SHRUB	NL
2. *Bromus* sp.	40	HERB	NL
3.			
4.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 0 %

Remarks:

HYDROLOGY

- ☐ Recorded Data (Describe in Remarks):
- ☐ Stream, Lake, or Tide Gauge
- ☒ Aerial Photographs
- ☐ Other
- ☒ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water: __NA__ (in.)

Depth to Free Water in Pit: __NA__ (in.)

Depth to Saturated Soil __NA___ (in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:

- ☐ Inundated
- ☐ Saturated in upper 12 inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):

- ☐ Oxidized root channels in upper 12 inches
- ☐ Water-stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (explain in Remarks)

Remarks: No hydrology.

PM WET 3_TR1_ PIT A

SOILS

Map Unit Name
(Series and Phase) ______________________. Drainage Class: ______________.
Field Observations
Taxonomy (Subgroup): ______________________ Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
___ Aquic Moisture Regime
___ Reducing Conditions
___ Gleyed or Low-Chroma Colors

___ Concretions
___ High Organic Content in Surface Layer in Sandy Soils
___ Organic Streaking in Sandy Soils
___ Listed on Local Hydric Soils List
___ Listed on National Hydric Soils List
___ Other (Explain in Remarks)

Remarks:
No soil pit dug, no vegetation, no hydrology.

WETLAND DETERMINATION

	(Circle)		
Hydrophytic Vegetation Present?	Yes [✓ No]		
Wetland Hydrology Present?	Yes [✓ No]		(Circle)
Hydric Soils Present?	Yes [✓ No]	Is this Sampling Point Within a Wetland?	Yes [✓ No]

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site:	Potential Mitigation Areas - Adjacent to Crystal Springs Reservoir	Date:	6/9/07
Applicant/Owner:	SFPUC	County:	San Mateo
Investigator:	Keven Colgate/Allison Pruett	State:	California
Do Normal Circumstances exist on the site?	☐Yes ☒No	Community ID:	Riparian
Is the site significantly disturbed (Atypical Situation)?	☒Yes ☐No	Plot ID:	PM WET 3
Is the area a potential Problem Area? (If needed, explain on reverse side.)	☒Yes ☐No	Transect ID:	TR1 - PIT B

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. *Salix lasiolepis*	100	TREE	FACW
2.			
3.			
4.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100 percent

Remarks: Other vegetation present but not dominant. Includes: *Phalaris* sp. (FAC-FACU), *Juncus* sp. (FAC-OBL), *Baccharis* sp.(NL).

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
☐ Stream, Lake, or Tide Gauge
☒ Aerial Photographs
☐ Other
☒ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water: __NA__ (in.)

Depth to Free Water in Pit: __NA__ (in.)

Depth to Saturated Soil __NA___ (in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:

☐ Inundated
☐ Saturated in upper 12 inches
☒ Water Marks
☐ Drift Lines
☐ Sediment Deposits
☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):

☐ Oxidized root channels in upper 12 inches
☒ Water-stained Leaves
☐ Local Soil Survey Data
☐ FAC-Neutral Test
☐ Other (explain in Remarks)

Remarks: May be an artificial drainage – no real outlet. Occupied with willows, no real flow indicators, but some evidence of ponding. Swale/depression, fed by culvert upstream which drains a small upland area.

PM WET 3_TR1_ PIT B

SOILS

Map Unit Name
(Series and Phase) ________________________________.
Drainage Class: ____________________.
Field Observations
Confirm Mapped Type? Yes No

Taxonomy (Subgroup): ________________________________

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-7	-	10YR 4/2	NA	NA	Silt.
7-14	-	10YR 4/2	2.5YR 5/6	60	Loamy silt.
14-16	-	2.5YR 5/6	10YR 4/2	25	Loamy silt.

Hydric Soil Indicators:

____ Histosol
____ Histic Epipedon
____ Sulfidic Odor
____ Aquic Moisture Regime
____ Reducing Conditions
____ Gleyed or Low-Chroma Colors

____ Concretions
____ High Organic Content in Surface Layer in Sandy Soils
____ Organic Streaking in Sandy Soils
____ Listed on Local Hydric Soils List
____ Listed on National Hydric Soils List
____ Other (Explain in Remarks)

Remarks:
Mottles with a chroma of 2 at 10 inches – hydric soil.

WETLAND DETERMINATION

(Circle)
Hydrophytic Vegetation Present? [✓ Yes] No
Wetland Hydrology Present? [✓ Yes] No
Hydric Soils Present? [✓ Yes] No

(Circle)
Is this Sampling Point Within a Wetland? [✓ Yes] No

Remarks:
Connectivity to reservoir is sketchy – currently the area appears hydrology isolated. May connect to reservoir on wet years.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site:	Potential Mitigation Areas - Adjacent to Crystal Springs Reservoir	Date:	6/9/07
Applicant/Owner:	SFPUC	County:	San Mateo
Investigator:	Keven Colgate/Allison Pruett	State:	California
Do Normal Circumstances exist on the site?	☐Yes ☒No	Community ID:	Vernal Wetland
Is the site significantly disturbed (Atypical Situation)?	☒Yes ☐No	Plot ID:	PM WET 4
Is the area a potential Problem Area? (If needed, explain on reverse side.)	☒Yes ☐No	Transect ID:	TR1 - PIT A

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. *Polypogen monspeliensis*	60	HERB	FACW+
2. *Euthamia occidentalis*	20	HERB	OBL
3. *Circium vulgare*	20	HERB	FACU
4.			
5.			
6.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100%

Remarks:

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
☐ Stream, Lake, or Tide Gauge
☒ Aerial Photographs
☐ Other
☒ No Recorded Data Available

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:
☐ Inundated
☐ Saturated in upper 12 inches
☐ Water Marks
☐ Drift Lines
☐ Sediment Deposits
☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
☐ Oxidized root channels in upper 12 inches
☐ Water-stained Leaves
☐ Local Soil Survey Data
☐ FAC-Neutral Test
☐ Other (explain in Remarks)

FIELD OBSERVATIONS:

Depth of Surface Water: __NA__ (in.)

Depth to Free Water in Pit: __NA__ (in.)

Depth to Saturated Soil __NA___ (in.)

Remarks: Drift line ends approximately 2 feet down slope. No indicators of ponding or flow. No hydrology.

PM WET 4_TR1_ PIT A

SOILS

Map Unit Name
(Series and Phase) ____.

Taxonomy (Subgroup): ____

Drainage Class: ______________________.
Field Observations
Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.

Hydric Soil Indicators:

____ Histosol
____ Histic Epipedon
____ Sulfidic Odor
____ Aquic Moisture Regime
____ Reducing Conditions
____ Gleyed or Low-Chroma Colors
____ Concretions
____ High Organic Content in Surface Layer in Sandy Soils
____ Organic Streaking in Sandy Soils
____ Listed on Local Hydric Soils List
____ Listed on National Hydric Soils List
____ Other (Explain in Remarks)

Remarks:
No pit dug – no hydrology.

WETLAND DETERMINATION

	(Circle)	
Hydrophytic Vegetation Present?	[✓ Yes]	No
Wetland Hydrology Present?	Yes	[✓ No]
Hydric Soils Present?	Yes	No ?

(Circle)

Is this Sampling Point Within a Wetland? Yes [✓ No]

Remarks:
No hydrology.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site:	Potential Mitigation Areas - Adjacent to Crystal Springs Reservoir	Date:	6/9/07
Applicant/Owner:	SFPUC	County:	San Mateo
Investigator:	Keven Colgate/Allison Pruett	State:	California
Do Normal Circumstances exist on the site?	☐Yes ☒No	Community ID:	Vernal Wetland
Is the site significantly disturbed (Atypical Situation)?	☒Yes ☐No	Plot ID:	PM WET 4
Is the area a potential Problem Area? (If needed, explain on reverse side.)	☒Yes ☐No	Transect ID:	TR1 - PIT B

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. *Rumex* sp. *(not flowering, likely R. crispus)*	20	HERB	FACW-
2. *Erigeron sp. (not flowering)*	20	HERB	FAC-OBL
3. *Circium vulgare*	10	HERB	FACU
4. *Polypogen monspeliensis*	10	HERB	FACW+
5. *Juncus mexicanus*	40	HERB	FACW
6.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): Vegetation assumed 100 percent

Remarks: Culvert located approximately 2 feet down slope. May cause water to backs up and pond.

HYDROLOGY

- ☐ Recorded Data (Describe in Remarks):
- ☐ Stream, Lake, or Tide Gauge
- ☒ Aerial Photographs
- ☐ Other
- ☒ No Recorded Data Available

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:

- ☐ Inundated
- ☐ Saturated in upper 12 inches
- ☒ Water Marks
- ☒ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):

- ☐ Oxidized root channels in upper 12 inches
- ☐ Water-stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (explain in Remarks)

FIELD OBSERVATIONS:

Depth of Surface Water: __NA__ (in.)

Depth to Free Water in Pit: __NA__ (in.)

Depth to Saturated Soil __NA___ (in.)

Remarks: Damp – not saturated.
Flow indicators apparent, but weak. Culvert drains a small upland area under the road.

PM WET 4_TR1_ PIT B

SOILS

Map Unit Name
(Series and Phase) ______________________________.
Drainage Class: ______________.
Taxonomy (Subgroup): ______________________________
Field Observations
Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-16	-	2.5YR 2.5/1	-	NA	Clay loam.

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
___ Aquic Moisture Regime
___ Reducing Conditions
_X_ Gleyed or Low-Chroma Colors
___ Concretions
___ High Organic Content in Surface Layer in Sandy Soils
___ Organic Streaking in Sandy Soils
___ Listed on Local Hydric Soils List
___ Listed on National Hydric Soils List
___ Other (Explain in Remarks)

Remarks:
Low Chroma matrix.

WETLAND DETERMINATION

(Circle)
Hydrophytic Vegetation Present? [✓ Yes] No
Wetland Hydrology Present? [✓ Yes] No
Hydric Soils Present? [✓ Yes] No

(Circle)
Is this Sampling Point Within a Wetland? [✓ Yes] No

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site:	Potential Mitigation Areas - Adjacent to Crystal Springs Reservoir	Date:	6/9/07
Applicant/Owner:	SFPUC	County:	San Mateo
Investigator:	Keven Colgate/Allison Pruett	State:	California
Do Normal Circumstances exist on the site?	☐Yes ☒No	Community ID:	Freshwater Marsh
Is the site significantly disturbed (Atypical Situation)?	☒Yes ☐No	Plot ID:	PM WET 1
Is the area a potential Problem Area? (If needed, explain on reverse side.)	☒Yes ☐No	Transect ID:	TR1 - PIT A

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. *Typha domingensis*	100	HERB	OBL
2.			
3.			
4.			
5.			
6.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100%

Remarks: Pit A located in an area dominated by 100 % cattail.

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
☐ Stream, Lake, or Tide Gauge
☒ Aerial Photographs
☐ Other
☒ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water: ___2___ (in.)

Depth to Free Water in Pit: ___0___ (in.)

Depth to Saturated Soil ___0___ (in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:
☒ Inundated
☒ Saturated in upper 12 inches
☒ Water Marks
☐ Drift Lines
☐ Sediment Deposits
☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
☐ Oxidized root channels in upper 12 inches
☐ Water-stained Leaves
☐ Local Soil Survey Data
☐ FAC-Neutral Test
☐ Other (explain in Remarks)

Remarks: Pit is inundated.

PM WET 1_TR1_ PIT A

SOILS

Map Unit Name
(Series and Phase) ________________________________.

Taxonomy (Subgroup): ________________________________

Drainage Class: ____________________.
Field Observations
Confirm Mapped Type? Yes [✓ No]

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-6	-	NA	NA	NA	water, roots, silt
6-8	-	NA	NA	NA	rock layer

Hydric Soil Indicators:

- ____ Histosol
- ____ Histic Epipedon
- ____ Sulfidic Odor
- ____ Aquic Moisture Regime
- X Reducing Conditions
- X Gleyed or Low-Chroma Colors
- ____ Concretions
- ____ High Organic Content in Surface Layer in Sandy Soils
- ____ Organic Streaking in Sandy Soils
- ____ Listed on Local Hydric Soils List
- ____ Listed on National Hydric Soils List
- ____ Other (Explain in Remarks)

Remarks:
Pit is totally inundated with water. No mineral soil is collectable, only a thin, watery black muck and a thick mass of Typha roots. Hard rock layer at approximately 8 inches. Water is a low chroma color, possibly gleyed. Black muck/organic streaking around root mass.

WETLAND DETERMINATION

(Circle)
Hydrophytic Vegetation Present? [✓ Yes] No
Wetland Hydrology Present? [✓ Yes] No
Hydric Soils Present? Yes [✓ No]

(Circle)
Is this Sampling Point Within a Wetland? Yes [✓ No]

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site: Potential Mitigation Areas - Adjacent to Crystal Springs Reservoir

Date: 6/9/07

Applicant/Owner: SFPUC

County: San Mateo

Investigator: Keven Colgate/Allison Pruett

State: California

Do Normal Circumstances exist on the site? ☐Yes ☒No

Community ID: Freshwater Marsh/Riparian

Is the site significantly disturbed (Atypical Situation)? ☒Yes ☐No

Plot ID: PM WET 1

Is the area a potential Problem Area? ☒Yes ☐No
(If needed, explain on reverse side.)

Transect ID: TR1 - PIT B

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. *Typha domingensis*	40	HERB	OBL
2. *Scirpus cernuus*	40	HERB	OBL
3. *Salix lasiolepis*	100	SHRUB	FACW
4. *Cortaderia* sp.	10	HERB	NL
5. *Juncus patens*	10	HERB	FAC
6.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100%

Remarks: Pit B located on edge of Typha community. Cover is dominated by Typha/Scirpus/Salix - other species are only occasional.

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
☐ Stream, Lake, or Tide Gauge
☒ Aerial Photographs
☐ Other
☒ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water: NA (in.)

Depth to Free Water in Pit: 4 (in.)

Depth to Saturated Soil 0 (in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:
☐ Inundated
☒ Saturated in upper 12 inches
☒ Water Marks
☐ Drift Lines
☐ Sediment Deposits
☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
☐ Oxidized root channels in upper 12 inches
☐ Water-stained Leaves
☐ Local Soil Survey Data
☐ FAC-Neutral Test
☐ Other (explain in Remarks)

Remarks: Pit quickly filled with water.

PM WET 1_TR1_ PIT B

SOILS

Map Unit Name
(Series and Phase) ______________________________.
Drainage Class: ______________.
Field Observations
Confirm Mapped Type? Yes [✓ No]

Taxonomy (Subgroup): ______________________________

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-3	-	7.5 YR 3/1	NA	NA	silty clay
3-7	-	7.5 YR 3/1	NA	NA	coarse sand, gravel, silty clay
7-?	-	?	NA	NA	rock layer

Hydric Soil Indicators:

- ___ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- ___ Aquic Moisture Regime
- _X_ Reducing Conditions
- _X_ Gleyed or Low-Chroma Colors
- ___ Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- ___ Listed on Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- ___ Other (Explain in Remarks)

Remarks:
Rock layer at approximately 7 inches, hydric soils above 7 inches.

WETLAND DETERMINATION

(Circle)

Hydrophytic Vegetation Present? [✓ Yes] No
Wetland Hydrology Present? [✓ Yes] No
Hydric Soils Present? Yes [✓ No]

(Circle)

Is this Sampling Point Within a Wetland? Yes [✓ No]

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site:	Potential Mitigation Areas - adjacent to Crystal Springs Reservoir	Date:	6/9/07
Applicant/Owner:	SFPUC	County:	San Mateo
Investigator:	Keven Colgate/Allison Pruett	State:	California
Do Normal Circumstances exist on the site?	☐Yes ☒No	Community ID:	Freshwater Marsh/Riparian
Is the site significantly disturbed (Atypical Situation)?	☒Yes ☐No	Plot ID:	PM WET 1
Is the area a potential Problem Area? (If needed, explain on reverse side.)	☒Yes ☐No	Transect ID:	TR1 - PIT C

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. *Holcus lanatus*	95	HERB	FAC
2.			
3.			
4.			
5.			
6.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100%

Remarks: Also present: *Picris echioides* (FAC+), *Lotus corniculatus* (FAC), *Cyperus eragrostis* (FACW), *Salix lasiolepis* (FACW), all less than 5% cover.

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
☐ Stream, Lake, or Tide Gauge
☒ Aerial Photographs
☐ Other
☒ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water: ___NA___ (in.)

Depth to Free Water in Pit: ___NA ___ (in.)

Depth to Saturated Soil ___NA ___ (in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:
☐ Inundated
☐ Saturated in upper 12 inches
☒ Water Marks
☐ Drift Lines
☐ Sediment Deposits
☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
☒ Oxidized root channels in upper 12 inches
☐ Water-stained Leaves
☐ Local Soil Survey Data
☒ FAC-Neutral Test
☐ Other (explain in Remarks)

Remarks: May receive groundwater from adjacent inundated areas. Soil is damp, but not saturated.

PM WET 1_TR1_ PIT C

SOILS

Map Unit Name
(Series and Phase) ____________________.
Taxonomy (Subgroup): ____________________

Drainage Class: ____________________.
Field Observations
Confirm Mapped Type? Yes [✓ No]

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-7	-	7.5 YR 4/2	NA	NA	coarse silty sand
7-?	-	NA	NA	NA	rock

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
___ Aquic Moisture Regime
X Reducing Conditions
X Gleyed or Low-Chroma Colors

___ Concretions
___ High Organic Content in Surface Layer in Sandy Soils
___ Organic Streaking in Sandy Soils
___ Listed on Local Hydric Soils List
___ Listed on National Hydric Soils List
___ Other (Explain in Remarks)

Remarks:
Rock layer at approximately 7 inches. No hydric indicators above rock layer.

WETLAND DETERMINATION

(Circle)
Hydrophytic Vegetation Present? [✓ Yes] No
Wetland Hydrology Present? [✓ Yes] No
Hydric Soils Present? Yes [✓ No]

(Circle)
Is this Sampling Point Within a Wetland? Yes [✓ No]

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site: Potential Mitigation Areas - Adjacent to Crystal Springs Reservoir

Date: 6/9/07

Applicant/Owner: SFPUC

County: San Mateo

Investigator: Keven Colgate/Allison Pruett

State: California

Do Normal Circumstances exist on the site? ☐Yes ☒No

Community ID: Vernal Wetland/Non-Native Grassland

Is the site significantly disturbed (Atypical Situation)? ☒Yes ☐No

Plot ID: PM WET 1

Is the area a potential Problem Area? ☒Yes ☐No
(If needed, explain on reverse side.)

Transect ID: TR1 - PIT D

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. *Hordeum marinum* ssp. *gussoneanum*	50	HERB	FAC
2. *Lotus corniculatus*	40	HERB	FAC
3. *Plantago coronopus*	10	HERB	FAC
4.			
5.			
6.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100%

Remarks: Also present: *Bellardia trixago* (NL) and *Trifolium campestre* (NL) at less than 1% cover.

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
☐ Stream, Lake, or Tide Gauge
☒ Aerial Photographs
☐ Other
☒ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water: ___NA___ (in.)

Depth to Free Water in Pit: ___NA ___ (in.)

Depth to Saturated Soil ___NA ___ (in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:
☐ Inundated
☐ Saturated in upper 12 inches
☐ Water Marks
☐ Drift Lines
☐ Sediment Deposits
☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
☒ Oxidized root channels in upper 12 inches
☐ Water-stained Leaves
☐ Local Soil Survey Data
☒ FAC-Neutral Test
☐ Other (explain in Remarks)

Remarks: Totally dry. No hydrology. Area is above the low ponded area.

PM WET 1_TR1_ PIT D

SOILS

Map Unit Name
(Series and Phase) ____________________.

Taxonomy (Subgroup): ____________________

Drainage Class: ____________________.
Field Observations
Confirm Mapped Type? Yes [✓ No]

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-9	-	Gley1 4/10Y	NA	NA	silty gravel
9-?	-	NA	NA	NA	rock

Hydric Soil Indicators:

____ Histosol
____ Histic Epipedon
____ Sulfidic Odor
____ Aquic Moisture Regime
____ Reducing Conditions
____ Gleyed or Low-Chroma Colors
____ Concretions
____ High Organic Content in Surface Layer in Sandy Soils
____ Organic Streaking in Sandy Soils
____ Listed on Local Hydric Soils List
____ Listed on National Hydric Soils List
____ Other (Explain in Remarks)

Remarks:
Gleyed color is likely from parent material. 95% gravel, interstitial silt is gleyed. Solid rock layer at approximately 9 inches.

WETLAND DETERMINATION

(Circle)
Hydrophytic Vegetation Present? [✓ Yes] No
Wetland Hydrology Present? [✓ Yes] No
Hydric Soils Present? Yes [✓ No]

(Circle)
Is this Sampling Point Within a Wetland? Yes [✓ No]

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site:	Potential Mitigation Areas - Adjacent to Crystal Springs Reservoir	Date:	6/9/07
Applicant/Owner:	SFPUC	County:	San Mateo
Investigator:	Keven Colgate/Allison Pruett	State:	California
Do Normal Circumstances exist on the site?	☐Yes ☒No	Community ID:	Freshwater Marsh
Is the site significantly disturbed (Atypical Situation)?	☒Yes ☐No	Plot ID:	PM WET 1
Is the area a potential Problem Area? (If needed, explain on reverse side.)	☒Yes ☐No	Transect ID:	TR2 - PIT A

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. *Typha domingensis*	100	HERB	OBL
2.			
3.			
4.			
5.			
6.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100 %

Remarks: 100 percent cover by Typha.

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
☐ Stream, Lake, or Tide Gauge
☒ Aerial Photographs
☐ Other
☒ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water: __1___ (in.)

Depth to Free Water in Pit: ___0___ (in.)

Depth to Saturated Soil ___0___ (in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:

☒ Inundated
☒ Saturated in upper 12 inches
☒ Water Marks
☐ Drift Lines
☐ Sediment Deposits
☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):

☐ Oxidized root channels in upper 12 inches
☐ Water-stained Leaves
☐ Local Soil Survey Data
☐ FAC-Neutral Test
☐ Other (explain in Remarks)

Remarks: Inundated.

PM WET 1_TR2_ PIT A

SOILS

Map Unit Name
(Series and Phase) ____________________.

Drainage Class: ____________________.

Taxonomy (Subgroup): ____________________

Field Observations
Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-4	-	NA	NA	NA	Root Wad
4-8	-	NA	NA	NA	Gravel
8-?		NA	NA	NA	Rock

Hydric Soil Indicators:

____ Histosol
____ Histic Epipedon
____ Sulfidic Odor
____ Aquic Moisture Regime
____ Reducing Conditions
____ Gleyed or Low-Chroma Colors

____ Concretions
____ High Organic Content in Surface Layer in Sandy Soils
____ Organic Streaking in Sandy Soils
____ Listed on Local Hydric Soils List
____ Listed on National Hydric Soils List
____ Other (Explain in Remarks)

Remarks:

Fibrous root mass from 0-4 inches, then gravel. Silty water is low-chroma. Cannot extract any mineral soil in order to check color. Soil assumed based on 100 percent cover by OBL species and inundation.

WETLAND DETERMINATION

(Circle)

Hydrophytic Vegetation Present? [✓ Yes] No
Wetland Hydrology Present? [✓ Yes] No
Hydric Soils Present? [✓ Yes] No

(Circle)

Is this Sampling Point Within a Wetland? [✓ Yes] No

Remarks:

Soil assumed based on 100 percent cover by OBL species and inundation.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site:	Potential Mitigation Areas - Adjacent to Crystal Springs Reservoir	Date:	6/9/07
Applicant/Owner:	SFPUC	County:	San Mateo
Investigator:	Keven Colgate/Allison Pruett	State:	California
Do Normal Circumstances exist on the site?	☐Yes ☒No	Community ID:	Vernal Wetland/ Freshwater Marsh
Is the site significantly disturbed (Atypical Situation)?	☒Yes ☐No	Plot ID:	PM WET 1
Is the area a potential Problem Area? (If needed, explain on reverse side.)	☒Yes ☐No	Transect ID:	TR2 - PIT B

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. *Typha domingensis*	50	HERB	OBL
2. *Scirpus cernuus*	20	HERB	OBL
3. *Epilobium ciliatum*	20	HERB	FACW
4.			
5.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100%

Remarks: Also: *Juncus cf. xiphioides* (OBL), *Polypogen monspiliensis* (FACW+), *Lotus corniculatis* (FAC).

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
☐ Stream, Lake, or Tide Gauge
☒ Aerial Photographs
☐ Other
☒ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water: __NA__ (in.)

Depth to Free Water in Pit: __NA__ (in.)

Depth to Saturated Soil __NA___ (in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:

☐ Inundated
☒ Saturated in upper 12 inches
☒ Water Marks
☐ Drift Lines
☐ Sediment Deposits
☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):

☐ Oxidized root channels in upper 12 inches
☐ Water-stained Leaves
☐ Local Soil Survey Data
☒ FAC-Neutral Test
☐ Other (explain in Remarks)

Remarks: Pit B located in transitional zone between *Typha* stand and Upland/Vernal Wetland community.

PM WET 1_TR2_ PIT B

SOILS

Map Unit Name
(Series and Phase) ______________________________. Drainage Class: ______________.

Field Observations
Confirm Mapped Type? Yes No

Taxonomy (Subgroup): ______________________________

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-3	-	2.5YR 3/1	NA	NA	Silty clay
3-11	-	Gley 2 6/5B	Gley 1 4/10YR	30%	Clay with gravel
3-11	-	Gley 2 6/5B	2.5 YR 4/8	3%	Clay with gravel
11-?	-	NA	NA	NA	Rock

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
___ Aquic Moisture Regime
___ Reducing Conditions
_X_ Gleyed or Low-Chroma Colors

___ Concretions
___ High Organic Content in Surface Layer in Sandy Soils
___ Organic Streaking in Sandy Soils
___ Listed on Local Hydric Soils List
___ Listed on National Hydric Soils List
___ Other (Explain in Remarks)

Remarks:
Rock layer at 11 inches.

WETLAND DETERMINATION

(Circle)
Hydrophytic Vegetation Present? [✓ Yes] No
Wetland Hydrology Present? [✓ Yes] No
Hydric Soils Present? [✓ Yes] No

(Circle)
Is this Sampling Point Within a Wetland? [✓ Yes] No

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site:	Potential Mitigation Areas - Adjacent to Crystal Springs Reservoir	Date:	6/9/07
Applicant/Owner:	SFPUC	County:	San Mateo
Investigator:	Keven Colgate/Allison Pruett	State:	California
Do Normal Circumstances exist on the site?	☐Yes ☒No	Community ID:	Vernal Wetland/ Non-Native Grassland
Is the site significantly disturbed (Atypical Situation)?	☒Yes ☐No	Plot ID:	PM WET 1
Is the area a potential Problem Area? (If needed, explain on reverse side.)	☒Yes ☐No	Transect ID:	TR2 - PIT C

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. *Polypogon monspeliensis*	30	HERB	FACW+
2. *Phalaris* sp.	20	HERB	FAC-FACU
3. *Lotus corniculatus*	20	HERB	FAC
4. *Cortaderia* sp.	25	HERB	NL
5.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 75%

Remarks: Also: *Sonchus asper* (FAC), *Briza minor* (FACW-), *Picris echoioides* (FAC+) (<5 percent cover). *Briza* approximately 10 percent cover.

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
☐ Stream, Lake, or Tide Gauge
☒ Aerial Photographs
☐ Other
☒ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water: _NA_ (in.)

Depth to Free Water in Pit: _NA_ (in.)

Depth to Saturated Soil _NA_ (in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:

☐ Inundated
☐ Saturated in upper 12 inches
☐ Water Marks
☐ Drift Lines
☐ Sediment Deposits
☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):

☐ Oxidized root channels in upper 12 inches
☐ Water-stained Leaves
☐ Local Soil Survey Data
☐ FAC-Neutral Test
☐ Other (explain in Remarks)

Remarks: Very dry, no hydrology. Evidence of ponding just down slope.

PM WET 1_TR2_ PIT C

SOILS

Map Unit Name
(Series and Phase) ______________________________. Drainage Class: ____________________.
Field Observations
Taxonomy (Subgroup): ______________________________ Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-5	-	2.5YR 4/3	NA	NA	Silty, coarse sand.
5-?	-	NA	NA	NA	Rock

Hydric Soil Indicators:

____ Histosol
____ Histic Epipedon
____ Sulfidic Odor
____ Aquic Moisture Regime
____ Reducing Conditions
____ Gleyed or Low-Chroma Colors
____ Concretions
____ High Organic Content in Surface Layer in Sandy Soils
____ Organic Streaking in Sandy Soils
____ Listed on Local Hydric Soils List
____ Listed on National Hydric Soils List
____ Other (Explain in Remarks)

Remarks:
Impermeable rock layer at 5 inches.

WETLAND DETERMINATION

	(Circle)			(Circle)	
Hydrophytic Vegetation Present?	[✓ Yes]	No			
Wetland Hydrology Present?	Yes	[✓ No]	Is this Sampling Point Within a Wetland?	Yes	[✓ No]
Hydric Soils Present?	Yes	[✓ No]			

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site:	Potential Mitigation Areas - Adjacent to Crystal Springs Reservoir	Date:	6/9/07
Applicant/Owner:	SFPUC	County:	San Mateo
Investigator:	Keven Colgate/Allison Pruett	State:	California
Do Normal Circumstances exist on the site?	☐Yes ☒No	Community ID:	Riparian
Is the site significantly disturbed (Atypical Situation)?	☒Yes ☐No	Plot ID:	PM WET 2
Is the area a potential Problem Area? (If needed, explain on reverse side.)	☒Yes ☐No	Transect ID:	TR1 - PIT A

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. *Salix lasiolepis*	100	TREE	FACW
2. *Rubus ursinus*	25	VINE	FACW+
3.			
4.			
5.			
6.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100 %

Remarks:

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
☐ Stream, Lake, or Tide Gauge
☒ Aerial Photographs
☐ Other
☒ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water: __NA__ (in.)

Depth to Free Water in Pit: __NA__ (in.)

Depth to Saturated Soil __NA___ (in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:
☐ Inundated
☐ Saturated in upper 12 inches
☒ Water Marks
☐ Drift Lines
☐ Sediment Deposits
☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
☐ Oxidized root channels in upper 12 inches
☒ Water-stained Leaves
☐ Local Soil Survey Data
☐ FAC-Neutral Test
☐ Other (explain in Remarks)

Remarks: Dry soil – fine powdery silt. Water stained leaves under willows. Evidence of ponding in adjacent open areas – some soil surface cracking. Weak indicators. Hydrology is sketchy at best.

PM WET 2_TR1_ PIT A

SOILS

Map Unit Name
(Series and Phase) ______.
Drainage Class: ______.
Field Observations
Confirm Mapped Type? Yes No
Taxonomy (Subgroup): ______

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-16	-	10YR 4/2	NA	NA	Fine silt.

Hydric Soil Indicators:

- ___ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- ___ Aquic Moisture Regime
- ___ Reducing Conditions
- ___ Gleyed or Low-Chroma Colors
- ___ Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- ___ Listed on Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- ___ Other (Explain in Remarks)

Remarks:
Uniform silty matrix – no hydric indicators. Earth worms in pit.

WETLAND DETERMINATION

	(Circle)	
Hydrophytic Vegetation Present?	[✓ Yes]	No
Wetland Hydrology Present?	[✓ Yes]	No
Hydric Soils Present?	Yes	[✓ No]

(Circle)
Is this Sampling Point Within a Wetland? Yes [✓ No]

Remarks:
Man made borrow pit area – berm constructed on east side.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site:	Potential Mitigation Areas - Adjacent to Crystal Springs Reservoir	Date:	6/9/07
Applicant/Owner:	SFPUC	County:	San Mateo
Investigator:	Keven Colgate/Allison Pruett	State:	California
Do Normal Circumstances exist on the site?	☐Yes ☒No	Community ID:	Vernal Wetland/Non-Native Grassland
Is the site significantly disturbed (Atypical Situation)?	☒Yes ☐No	Plot ID:	PM WET 2
Is the area a potential Problem Area? (If needed, explain on reverse side.)	☒Yes ☐No	Transect ID:	TR1 - PIT B

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. *Salix lasiolepis*	70	TREE	FACW
2. *Scirpus cernuus*	20	HERB	OBL
3.			
4.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100 %

Remarks: Open, nearly unvegetated area. *Salix lasiolepis* is adjacent and overhead, *Scirpus cernuus* immediately at pit.

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
☐ Stream, Lake, or Tide Gauge
☒ Aerial Photographs
☐ Other
☒ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water: __NA__ (in.)

Depth to Free Water in Pit: __NA__ (in.)

Depth to Saturated Soil __NA___ (in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:
☐ Inundated
☐ Saturated in upper 12 inches
☒ Water Marks
☒ Drift Lines
☐ Sediment Deposits
☒ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
☐ Oxidized root channels in upper 12 inches
☐ Water-stained Leaves
☐ Local Soil Survey Data
☐ FAC-Neutral Test
☐ Other (explain in Remarks)

Remarks: Damp silty soil, algal mats hanging from willow branches about 3.5 feet off the ground. Inundation area is indicated by lack of leaves and lack of *Rubus* (Pit A). Algal mat corresponds with vegetation boundary. Some channeling is visible. Area is hydraulically isolated from reservoir.

PM WET 2_TR1_ PIT B

SOILS

Map Unit Name
(Series and Phase) ______________________. Drainage Class: ______________.
Field Observations
Taxonomy (Subgroup): ______________________ Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-9	-	10YR 4/2	NA	NA	Fine silty clay.
9-16	-	GI 2.5/10YR	NA	NA	Fine silty clay.

Hydric Soil Indicators:

- ____ Histosol
- ____ Histic Epipedon
- ____ Sulfidic Odor
- ____ Aquic Moisture Regime
- ____ Reducing Conditions
- _X_ Gleyed or Low-Chroma Colors
- ____ Concretions
- ____ High Organic Content in Surface Layer in Sandy Soils
- ____ Organic Streaking in Sandy Soils
- ____ Listed on Local Hydric Soils List
- ____ Listed on National Hydric Soils List
- ____ Other (Explain in Remarks)

Remarks:
Gleyed layers.

WETLAND DETERMINATION

(Circle)
Hydrophytic Vegetation Present? [✓ Yes] No
Wetland Hydrology Present? [✓ Yes] No
Hydric Soils Present? [✓ Yes] No

(Circle)
Is this Sampling Point Within a Wetland? [✓ Yes] No

Remarks:

Isolated ponded area - potentially not jurisdictional.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site:	Potential Mitigation Areas - Adjacent to Crystal Springs Reservoir	Date:	6/9/07
Applicant/Owner:	SFPUC	County:	San Mateo
Investigator:	Keven Colgate/Allison Pruett	State:	California
Do Normal Circumstances exist on the site?	☐Yes ☒No	Community ID:	Coastal Sage Scrub/Non-Native Grassland
Is the site significantly disturbed (Atypical Situation)?	☒Yes ☐No	Plot ID:	PM WET 3
Is the area a potential Problem Area? (If needed, explain on reverse side.)	☒Yes ☐No	Transect ID:	TR1 - PIT A

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. *Baccharis pilularis*	100	SHRUB	NL
2. *Bromus* sp.	40	HERB	NL
3.			
4.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 0 %

Remarks:

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
☐ Stream, Lake, or Tide Gauge
☒ Aerial Photographs
☐ Other
☒ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water: _NA_ (in.)

Depth to Free Water in Pit: _NA_ (in.)

Depth to Saturated Soil _NA_ (in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:

☐ Inundated
☐ Saturated in upper 12 inches
☐ Water Marks
☐ Drift Lines
☐ Sediment Deposits
☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):

☐ Oxidized root channels in upper 12 inches
☐ Water-stained Leaves
☐ Local Soil Survey Data
☐ FAC-Neutral Test
☐ Other (explain in Remarks)

Remarks: No hydrology.

PM WET 3_TR1_ PIT A

SOILS

Map Unit Name
(Series and Phase) ________________________________.
Drainage Class: ____________________.
Field Observations
Confirm Mapped Type? Yes No

Taxonomy (Subgroup): ________________________________

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
___ Aquic Moisture Regime
___ Reducing Conditions
___ Gleyed or Low-Chroma Colors

___ Concretions
___ High Organic Content in Surface Layer in Sandy Soils
___ Organic Streaking in Sandy Soils
___ Listed on Local Hydric Soils List
___ Listed on National Hydric Soils List
___ Other (Explain in Remarks)

Remarks:
No soil pit dug, no vegetation, no hydrology.

WETLAND DETERMINATION

(Circle)
Hydrophytic Vegetation Present? Yes [✓ No]
Wetland Hydrology Present? Yes [✓ No]
Hydric Soils Present? Yes [✓ No]

(Circle)
Is this Sampling Point Within a Wetland? Yes [✓ No]

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site:	Potential Mitigation Areas - Adjacent to Crystal Springs Reservoir	Date:	6/9/07
Applicant/Owner:	SFPUC	County:	San Mateo
Investigator:	Keven Colgate/Allison Pruett	State:	California
Do Normal Circumstances exist on the site?	☐Yes ☒No	Community ID:	Riparian
Is the site significantly disturbed (Atypical Situation)?	☒Yes ☐No	Plot ID:	PM WET 3
Is the area a potential Problem Area? (If needed, explain on reverse side.)	☒Yes ☐No	Transect ID:	TR1 - PIT B

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. *Salix lasiolepis*	100	TREE	FACW
2.			
3.			
4.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100 percent

Remarks: Other vegetation present but not dominant. Includes: *Phalaris* sp. (FAC-FACU), *Juncus* sp. (FAC-OBL), *Baccharis* sp.(NL).

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
☐ Stream, Lake, or Tide Gauge
☒ Aerial Photographs
☐ Other
☒ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water: __NA__ (in.)

Depth to Free Water in Pit: __NA__ (in.)

Depth to Saturated Soil __NA___ (in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:
☐ Inundated
☐ Saturated in upper 12 inches
☒ Water Marks
☐ Drift Lines
☐ Sediment Deposits
☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
☐ Oxidized root channels in upper 12 inches
☒ Water-stained Leaves
☐ Local Soil Survey Data
☐ FAC-Neutral Test
☐ Other (explain in Remarks)

Remarks: May be an artificial drainage – no real outlet. Occupied with willows, no real flow indicators, but some evidence of ponding. Swale/depression, fed by culvert upstream which drains a small upland area.

PM WET 3_TR1_ PIT B

SOILS

Map Unit Name
(Series and Phase) ______________________________.

Taxonomy (Subgroup): ______________________________

Drainage Class: ______________.
Field Observations
Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-7	-	10YR 4/2	NA	NA	Silt.
7-14	-	10YR 4/2	2.5YR 5/6	60	Loamy silt.
14-16	-	2.5YR 5/6	10YR 4/2	25	Loamy silt.

Hydric Soil Indicators:

____ Histosol
____ Histic Epipedon
____ Sulfidic Odor
____ Aquic Moisture Regime
____ Reducing Conditions
____ Gleyed or Low-Chroma Colors

____ Concretions
____ High Organic Content in Surface Layer in Sandy Soils
____ Organic Streaking in Sandy Soils
____ Listed on Local Hydric Soils List
____ Listed on National Hydric Soils List
____ Other (Explain in Remarks)

Remarks:
Mottles with a chroma of 2 at 10 inches – hydric soil.

WETLAND DETERMINATION

(Circle)
Hydrophytic Vegetation Present? [✓ Yes] No
Wetland Hydrology Present? [✓ Yes] No
Hydric Soils Present? [✓ Yes] No

(Circle)
Is this Sampling Point Within a Wetland? [✓ Yes] No

Remarks:
Connectivity to reservoir is sketchy – currently the area appears hydrology isolated. May connect to reservoir on wet years.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site:	Potential Mitigation Areas - Adjacent to Crystal Springs Reservoir	Date:	6/9/07
Applicant/Owner:	SFPUC	County:	San Mateo
Investigator:	Keven Colgate/Allison Pruett	State:	California
Do Normal Circumstances exist on the site?	☐Yes ☒No	Community ID:	Vernal Wetland
Is the site significantly disturbed (Atypical Situation)?	☒Yes ☐No	Plot ID:	PM WET 4
Is the area a potential Problem Area? (If needed, explain on reverse side.)	☒Yes ☐No	Transect ID:	TR1 - PIT A

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. *Polypogen monspeliensis*	60	HERB	FACW+
2. *Euthamia occidentalis*	20	HERB	OBL
3. *Circium vulgare*	20	HERB	FACU
4.			
5.			
6.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100%

Remarks:

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
☐ Stream, Lake, or Tide Gauge
☒ Aerial Photographs
☐ Other
☒ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water: __NA__ (in.)

Depth to Free Water in Pit: __NA__ (in.)

Depth to Saturated Soil __NA___ (in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:

☐ Inundated
☐ Saturated in upper 12 inches
☐ Water Marks
☐ Drift Lines
☐ Sediment Deposits
☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):

☐ Oxidized root channels in upper 12 inches
☐ Water-stained Leaves
☐ Local Soil Survey Data
☐ FAC-Neutral Test
☐ Other (explain in Remarks)

Remarks: Drift line ends approximately 2 feet down slope. No indicators of ponding or flow. No hydrology.

PM WET 4_TR1_ PIT A

SOILS

Map Unit Name
(Series and Phase) ____________________.
Drainage Class: ____________________.
Field Observations
Confirm Mapped Type? Yes No
Taxonomy (Subgroup): ____________________

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.

Hydric Soil Indicators:

____ Histosol
____ Histic Epipedon
____ Sulfidic Odor
____ Aquic Moisture Regime
____ Reducing Conditions
____ Gleyed or Low-Chroma Colors
____ Concretions
____ High Organic Content in Surface Layer in Sandy Soils
____ Organic Streaking in Sandy Soils
____ Listed on Local Hydric Soils List
____ Listed on National Hydric Soils List
____ Other (Explain in Remarks)

Remarks:
No pit dug – no hydrology.

WETLAND DETERMINATION

(Circle)
Hydrophytic Vegetation Present? [✓ Yes] No
Wetland Hydrology Present? Yes [✓ No]
Hydric Soils Present? Yes No ?

(Circle)
Is this Sampling Point Within a Wetland? Yes [✓ No]

Remarks:
No hydrology.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site: Potential Mitigation Areas - Adjacent to Crystal Springs Reservoir
Date: 6/9/07
Applicant/Owner: SFPUC
County: San Mateo
Investigator: Keven Colgate/Allison Pruett
State: California
Do Normal Circumstances exist on the site? ☐Yes ☒No
Community ID: Vernal Wetland
Is the site significantly disturbed (Atypical Situation)? ☒Yes ☐No
Plot ID: PM WET 4
Is the area a potential Problem Area? ☒Yes ☐No
(If needed, explain on reverse side.)
Transect ID: TR1 - PIT B

VEGETATION

Dominant Plant Species	Relative Percent Cover	Stratum	Indicator
1. *Rumex* sp. *(not flowering, likely R. crispus)*	20	HERB	FACW-
2. *Erigeron sp. (not flowering)*	20	HERB	FAC-OBL
3. *Circium vulgare*	10	HERB	FACU
4. *Polypogen monspeliensis*	10	HERB	FACW+
5. *Juncus mexicanus*	40	HERB	FACW
6.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): Vegetation assumed 100 percent

Remarks: Culvert located approximately 2 feet down slope. May cause water to backs up and pond.

HYDROLOGY

- ☐ Recorded Data (Describe in Remarks):
- ☐ Stream, Lake, or Tide Gauge
- ☒ Aerial Photographs
- ☐ Other
- ☒ No Recorded Data Available

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:

- ☐ Inundated
- ☐ Saturated in upper 12 inches
- ☒ Water Marks
- ☒ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):

- ☐ Oxidized root channels in upper 12 inches
- ☐ Water-stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (explain in Remarks)

FIELD OBSERVATIONS:

Depth of Surface Water: __NA__ (in.)

Depth to Free Water in Pit: __NA__ (in.)

Depth to Saturated Soil __NA___ (in.)

Remarks: Damp – not saturated.
Flow indicators apparent, but weak. Culvert drains a small upland area under the road.

PM WET 4_TR1_ PIT B

SOILS

Map Unit Name
(Series and Phase) ______________________.

Drainage Class: ______________.

Field Observations
Confirm Mapped Type? Yes No

Taxonomy (Subgroup): ______________________

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-16	-	2.5YR 2.5/1	-	NA	Clay loam.

Hydric Soil Indicators:

- ___ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- ___ Aquic Moisture Regime
- ___ Reducing Conditions
- X Gleyed or Low-Chroma Colors
- ___ Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- ___ Listed on Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- ___ Other (Explain in Remarks)

Remarks:
Low Chroma matrix.

WETLAND DETERMINATION

(Circle)

Hydrophytic Vegetation Present? [✓ Yes] No
Wetland Hydrology Present? [✓ Yes] No
Hydric Soils Present? [✓ Yes] No

(Circle)

Is this Sampling Point Within a Wetland? [✓ Yes] No

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site: Crystal Springs Reservoirs

Date: 03/09/2007

Applicant/Owner: SFPUC

County: San Mateo

Investigator: G. Lebednik, R. Johnson

State: California

Do Normal Circumstances exist on the site? ☐Yes ☐No

Community ID: Herbaceous

Is the site significantly disturbed (Atypical Situation)? ☐Yes ☐No

Plot ID: NJ TR1A

Is the area a potential Problem Area? ☐Yes ☐No
(If needed, explain on reverse side.)

Transect ID: NJ TR1

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Carex* sp.	H	FACW-OBL	9.		
2. unidentified *grass*	H	varies	10.		
3. *Quercus*	S	NL	11.		
4.			12.		
5.			13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 33% to 67%

Remarks:

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
☐ Stream, Lake, or Tide Gauge
☐ Aerial Photographs
☐ Other
☐ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water: N/A (in.)

Depth to Free Water in Pit: 13 (in.)

Depth to Saturated Soil 11 (in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:
☐ Inundated
☐ Saturated in upper 12 inches
☐ Water Marks
☐ Drift Lines
☐ Sediment Deposits
☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
☐ Oxidized root channels in upper 12 inches
☐ Water-stained Leaves
☐ Local Soil Survey Data
☐ FAC-Neutral Test
☐ Other (explain in Remarks)

Remarks: Water in reservoir was high

SOILS

Plot ID: NJ TR1A

Map Unit Name
(Series and Phase) Candlestick variant loam, 2 to 15 percent slopes

Taxonomy (Subgroup): Pachic Argiustoll

Drainage Class: well-drained
Field Observations
Confirm Mapped Type? Yes [✓ No]

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-5		10YR 3/3			Sandy, many roots
5-13		10YR 5/3			Coarse sand
13-16		!0YR 3/2			silty

Hydric Soil Indicators:

____ Histosol
____ Histic Epipedon
____ Sulfidic Odor
____ Aquic Moisture Regime
____ Reducing Conditions
____ Gleyed or Low-Chroma Colors
____ Concretions
____ High Organic Content in Surface Layer in Sandy Soils
____ Organic Streaking in Sandy Soils
____ Listed on Local Hydric Soils List
____ Listed on National Hydric Soils List
____ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

(Circle)
Hydrophytic Vegetation Present? Yes No
Wetland Hydrology Present? [✓ Yes] No
Hydric Soils Present? Yes [✓ No]

(Circle)
Is this Sampling Point Within a Wetland? Yes [✓ No]

Remarks:
Vegetation may be hydrophytic

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site: Crystal Springs Reservoirs | Date: 03/09/2007
Applicant/Owner: SFPUC | County: San Mateo
Investigator: G. Lebednik, R. Johnson | State: California
Do Normal Circumstances exist on the site? ☒Yes ☐No | Community ID: Herbaceous
Is the site significantly disturbed (Atypical Situation)? ☐Yes ☒No | Plot ID: NJ TR1B
Is the area a potential Problem Area? ☐Yes ☒No | Transect ID: NJ TR1
(If needed, explain on reverse side.)

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Phalaris aquatica*	H	FAC+	9.		
2. *Carex* sp.	H	FACW-OBL	10.		
3. *Dipsacus sativus*	H	NI	11.		
4. *Quercus*	S	NL	12.		
5. *Baccharis pilularis*	S	NL	13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): < 50%

Remarks:

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
☐ Stream, Lake, or Tide Gauge
☒ Aerial Photographs
☐ Other
☐ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water: N/A (in.)

Depth to Free Water in Pit: 16 (in.)

Depth to Saturated Soil 14 (in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:
☐ Inundated
☐ Saturated in upper 12 inches
☐ Water Marks
☐ Drift Lines
☐ Sediment Deposits
☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
☐ Oxidized root channels in upper 12 inches
☐ Water-stained Leaves
☐ Local Soil Survey Data
☐ FAC-Neutral Test
☐ Other (explain in Remarks)

Remarks: Water in reservoir was high

SOILS

Plot ID: NJ TR1B

Map Unit Name
(Series and Phase) Candlestick variant loam, 2 to 15 percent slopes

Taxonomy (Subgroup): Pachic Argiustoll

Drainage Class: well-drained

Field Observations
Confirm Mapped Type? Yes [✓ No]

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-6		10YR 3/2	none		silty
6 – 12.2		10YR 3/2	10YR 4/4	Medium, some	silty

Hydric Soil Indicators:

____ Histosol
____ Histic Epipedon
____ Sulfidic Odor
____ Aquic Moisture Regime
____ Reducing Conditions
____ Gleyed or Low-Chroma Colors

____ Concretions
____ High Organic Content in Surface Layer in Sandy Soils
____ Organic Streaking in Sandy Soils
____ Listed on Local Hydric Soils List
____ Listed on National Hydric Soils List
____ Other (Explain in Remarks)

Remarks:

Mottles not bright

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	Yes [✓ No]	(Circle)
Wetland Hydrology Present?	Yes [✓ No]	
Hydric Soils Present?	Yes [✓ No]	

(Circle)

Is this Sampling Point Within a Wetland? Yes [✓ No]

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site: Crystal Springs Reservoirs
Date: 03/09/2007
Applicant/Owner: SFPUC
County: San Mateo
Investigator: G. Lebednik, R. Johnson
State: California

Do Normal Circumstances exist on the site? ☒Yes ☐No
Community ID: Herbaceous
Is the site significantly disturbed (Atypical Situation)? ☐Yes ☒No
Plot ID: NJ TR1C
Is the area a potential Problem Area? ☐Yes ☒No
(If needed, explain on reverse side.)
Transect ID: NJ TR1

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Carex* sp.	H	FACW-OBL	9.		
2. *Juncus patens*	H	FAC	10.		
3. *Phalaris aquatica*	H	FAC+	11.		
4. *Dipsacus sativus*	H	NI	12.		
5. *Quercus*	S	NL	13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): >50%

Remarks:

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
☐ Stream, Lake, or Tide Gauge
☒ Aerial Photographs
☐ Other
☐ No Recorded Data Available

FIELD OBSERVATIONS:

Depth of Surface Water: N/A (in.)

Depth to Free Water in Pit: >16 (in.)

Depth to Saturated Soil 14 (in.)

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:

☐ Inundated
☐ Saturated in upper 12 inches
☐ Water Marks
☐ Drift Lines
☐ Sediment Deposits
☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):

☐ Oxidized root channels in upper 12 inches
☐ Water-stained Leaves
☐ Local Soil Survey Data
☐ FAC-Neutral Test
☐ Other (explain in Remarks)

Remarks: Water in reservoir was high

SOILS

Plot ID: NJ TR1C

Map Unit Name
(Series and Phase) Candlestick variant loam, 2 to 15 percent slopes

Taxonomy (Subgroup): Pachic Argiustoll

Drainage Class: well-drained
Field Observations
Confirm Mapped Type? Yes [✓ No]

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-9.5		10YR 3/1	7.5YR 4/6	few	Silty/sandy/gravel

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
___ Aquic Moisture Regime
___ Reducing Conditions
X Gleyed or Low-Chroma Colors

___ Concretions
___ High Organic Content in Surface Layer in Sandy Soils
___ Organic Streaking in Sandy Soils
___ Listed on Local Hydric Soils List
___ Listed on National Hydric Soils List
___ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present? [✓ Yes] No (Circle)
Wetland Hydrology Present? Yes [✓ No]
Hydric Soils Present? [✓ Yes] No

(Circle)
Is this Sampling Point Within a Wetland? Yes [✓ No]

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE WETLANDS DELINEATION MANUAL)

Project/Site:	Crystal Springs Reservoirs	Date:	03/09/2007
Applicant/Owner:	SFPUC	County:	San Mateo
Investigator:	G. Lebednik, R. Johnson	State:	California

Do Normal Circumstances exist on the site? ☒Yes ☐No Community ID: Riparian

Is the site significantly disturbed (Atypical Situation)? ☐Yes ☒No Plot ID: NJ TR2A

Is the area a potential Problem Area? ☐Yes ☒No Transect ID: NJ TR2
(If needed, explain on reverse side.)

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Salix lasiolepis*	S	FACW	9.		
2. *Rubus ursinus*	S	FACW*	10.		
3. *Claytonia perfoliata*	H	FAC	11.		
4.			12.		
5.			13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100%, but no obligates

Remarks: * *Rubus ursinus* includes formerly separate taxa that had different indicator statuses. The indicator status provided here is the most likely for this populations

HYDROLOGY

☐ Recorded Data (Describe in Remarks):
☐ Stream, Lake, or Tide Gauge
☒ Aerial Photographs
☐ Other
☐ No Recorded Data Available

WETLAND HYDROLOGY INDICATORS:

Primary Indicators:
☐ Inundated
☐ Saturated in upper 12 inches
☐ Water Marks
☐ Drift Lines
☐ Sediment Deposits
☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
☐ Oxidized root channels in upper 12 inches
☐ Water-stained Leaves
☐ Local Soil Survey Data
☒ FAC-Neutral Test
☐ Other (explain in Remarks)

FIELD OBSERVATIONS:

Depth of Surface Water: N/A (in.)

Depth to Free Water in Pit: >16 (in.)

Depth to Saturated Soil >16 (in.)

Remarks: Water in reservoir was high

Plot ID: NJ TR2A

Map Unit Name
(Series and Phase) Candlestick variant loam, 2 to 15 percent slopes

Drainage Class: well-drained

Taxonomy (Subgroup): Pachic Argiustoll

Field Observations
Confirm Mapped Type? Yes [✓ No]

Profile Description:

Depth (inches)	Horizon	Matrix Colors (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-1.5		10YR 3/2			Also light sandy areas 10YR 4/4
1.5-4.5		10YR 5/3	7.5YR 6/8	Few, scattered	sandy
4.5-24		10YR 6/4			Coarse sand

Hydric Soil Indicators:

- ___ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- ___ Aquic Moisture Regime
- ___ Reducing Conditions
- ___ Gleyed or Low-Chroma Colors
- ___ Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- ___ Listed on Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- ___ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present? [✓ Yes] No (Circle)
Wetland Hydrology Present? Yes [✓ No]
Hydric Soils Present? Yes [✓ No]

(Circle)
Is this Sampling Point Within a Wetland? Yes [✓ No]

Remarks:

Appendix D

Wetland and Other Waters of the United States Site Information

Appendix D: Wetlands and Other Waters of the United States Site Information

Field Team: Keven Ann Colgate, Sara Ebrahim

SITE[1]	TRANSECT[2]	SURVEY DATE	WATERBODY	JURISDICTIONAL WETLAND	DOMINANT VEGETATION[3]	PRIMARY HYDROLOGIC INDICATORS[3]	SOIL INDICATORS[3]	WETLAND COMMUNITY TYPES	JURISDICTIONAL AREA (ACRES)[5]	COMMENTS (OWUS length in feet)
WET1	1	07/27/06	Tracy Lake	Jurisdictional Wetland	*Xanthium strumarium* *Scirpus cernuus* *Mentha pulegium* *Phyla nodiflora*	Drift line, benching	Low chroma matrix with mottles	Herbaceous Wetland Scirpus/Typha	9.62 0.05	
	2				*Polypogon monspeliensis* *Xanthium strumarium* *Scirpus cernuus*	Drift line, benching	Low chroma matrix with mottles			
	3				---	Scour, benching	No Wetland Soils			Wetland vegetation and hydrology, but does not meet soil criterion
OWUS1 A	--	07/27/06	Tracy Lake	OWUS	--	Scour, benching	--	--	0.02	182.12
OWUS1 B	--	07/27/06	Tracy Lake	OWUS	--	Scour, benching	--	--	0.05	515.87
WET2	1	07/25/06	Lower Crystal Springs	Jurisdictional Wetland	*Polypogon monspeliensis* *Phyla nodiflora* *Cyperus eragrostis* *Rumex crispus* *Xanthium strumarium* *Eleocharis montevidensis*	Watermarks	Low chroma matrix	Herbaceous Wetland Scirpus/Typha Riparian	32.95 1.25 0.62	
	2	07/26/06			*Polygonum monspeliensis* *Phyla nodiflora* *Rumex crispus* *Mentha pulegium* *Eleocharis montevidensis*	Drift line				
	3	07/27/06			*Lolium multiflorum* *Phyla nodiflora* *Mentha pulegium* *Polypogon monspeliensis* *Cyperus eragrostis*	Drift line, saturated in the upper 12"				Depression vegetated with arroyo willow
	4	08/05/06			*Mentha pulegium* *Polypogon monspeliensis* *Phyla nodiflora* *Lythrum tribracteatum* *Euthamia occidentalis*	Drift line				
OWUS2 A	--	08/05/06	Lower Crystal Springs	OWUS	--	Scour, benching	--	--	0.01	131.21

Appendix D: Wetlands and Other Waters of the United States Site Information

Field Team: Keven Ann Colgate, Sara Ebrahim

SITE[1]	TRANSECT[2]	SURVEY DATE	WATERBODY	JURISDICTIONAL WETLAND	DOMINANT VEGETATION[3]	PRIMARY HYDROLOGIC INDICATORS[3]	SOIL INDICATORS[3]	WETLAND COMMUNITY TYPES	JURISDICTIONAL AREA (ACRES)[3]	COMMENTS (OWUS length in feet)
OWUS2 B	--	08/05/06	Lower Crystal Springs	OWUS	--	Scour, benching	--	--	0.01	193.97
OWUS2 C	outside revis	--	--	--	--	--	--	--	--	--
OWUS2 D	--	08/05/06	Lower Crystal Springs	OWUS	--	Scour, benching	--	--	0.002	44.74
OWUS2 E	--	08/05/06	Lower Crystal Springs	OWUS	--	Scour, benching	--	--	0.002	37.71
OWUS2 F	--	08/05/06	Lower Crystal Springs	OWUS	--	Scour, benching	--	--	0.01	102.64
OWUS2 G	--	08/05/06	Lower Crystal Springs	OWUS	--	Scour, benching	--	--	0.003	77.07
WET3	1	07/26/06	Lower Crystal Springs	Jurisdictional Wetland	*Polygonum monspeliensis* *Phyla nodiflora* *Rumex crispus* *Mentha pulegium* *Eleocharis montevidensis*	Watermarks	Low chroma matrix with mottles	Herbaceous Wetland Scirpus/Typha	1.75 0.02	
OWUS3	--	08/05/06	Lower Crystal Springs	OWUS	--	Scour, benching	--	--	0.02	140.79
WET4	--	07/29/06	Lower Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM	Wetland Soils Assumed	Herbaceous Wetland	0.01	

Appendix D: Wetlands and Other Waters of the United States Site Information

Field Team: Keven Ann Colgate, Sara Ebrahim

SITE[1]	TRANSECT[2]	SURVEY DATE	WATERBODY	JURISDICTIONAL WETLAND	DOMINANT VEGETATION[3]	PRIMARY HYDROLOGIC INDICATORS[3]	SOIL INDICATORS[3]	WETLAND COMMUNITY TYPES	JURISDICTIONAL AREA (ACRES)[3]	COMMENTS (OWUS length in feet)
WET5	1	07/29/06	Lower Crystal Springs	Jurisdictional Wetland	*Phyla nodiflora* *Lolium multiflorum* *Polypogon monspeliensis* *Cyperus eragrostis* *Scirpus cernuus*	Drift lines	Low chroma matrix with mottles	Herbaceous Wetland	2.89	
OWUS5 A	--	08/05/06	Lower Crystal Springs	OWUS	--	Scour, benching	--	--	0.01	86.33
OWUS5 B	--	08/05/06	Lower Crystal Springs	OWUS	--	Scour, benching	--	--	0.02	195.15
WET6	--	07/30/06	Lower Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland	0.31	
OWUS6	--	08/05/06	Lower Crystal Springs	OWUS	--	Scour, benching	--	--	0.004	121.35
WET7	1	07/31/06	Lower Crystal Springs	Jurisdictional Wetland	*Cyperus eragrostis* *Phyla nodiflora* *Polypogon monspeliensis*	Drift lines	Low chroma matrix with mottles	Herbaceous Wetland	0.14	
OWUS7	--	08/05/06	Lower Crystal Springs	OWUS	--	Scour, benching	--	--	0.01	130.72
WET8	1	08/05/06	Lower Crystal Springs	Jurisdictional Wetland	*Phyla nodiflora* *Lythrum tribracteatum* *Mentha pulegium* *Leontodon taraxacoides*	Drift lines	Low chroma matrix with mottles	Herbaceous Wetland Scirpus/Typha Riparian	0.67 0.06 0.02	
OWUS8 A	--	08/05/06	Lower Crystal Springs	OWUS	--	Scour, benching	--	--	0.003	92.57

Appendix D: Wetlands and Other Waters of the United States Site Information

Field Team: Keven Ann Colgate, Sara Ebrahim

SITE[1]	TRANSECT[2]	SURVEY DATE	WATERBODY	JURISDICTIONAL WETLAND	DOMINANT VEGETATION[3]	PRIMARY HYDROLOGIC INDICATORS[3]	SOIL INDICATORS[3]	WETLAND COMMUNITY TYPES	JURISDICTIONAL AREA (ACRES)[5]	COMMENTS (OWUS length in feet)
OWUS8 B	--	08/05/06	Lower Crystal Springs	OWUS	--	Scour, benching	--	--	0.001	52.89
WET9	--	08/01/06	Lower Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland	0.03	
WET10		08/2/06 07/28/06	Lower Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland Riparian	0.02 0.03	
OWUS10	--	08/05/06	Lower Crystal Springs	OWUS	--	Scour, benching	--	--	0.001	28.89
WET11	--	08/03/06	Lower Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland	0.03	
OWUS11	--	08/05/06	Lower Crystal Springs	OWUS	--	Scour, benching	--	--	0.003	68.54
WET12	1	07/29/06	Lower Crystal Springs	Jurisdictional Wetland	*Baccharis douglasii*	Drift lines	Low chroma matrix with mottles	Herbaceous Wetland	0.12	
OWUS12	--	08/04/06	Lower Crystal Springs	OWUS	--	Scour, benching	--	--	0.003	79.30
WET13	--	09/03/06	Lower Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland Scirpus/Typha	1.37 0.03	

Appendix D: Wetlands and Other Waters of the United States Site Information

Field Team: Neven Ann Colgate, Sara Ebrahim

SITE[1]	TRANSECT[2]	SURVEY DATE	WATERBODY	JURISDICTIONAL WETLAND	DOMINANT VEGETATION[3]	PRIMARY HYDROLOGIC INDICATORS[3]	SOIL INDICATORS[3]	WETLAND COMMUNITY TYPES	JURISDICTIONAL AREA (ACRES)[3]	COMMENTS (OWUS length in feet)
OWUS13	--	09/03/06	Lower Crystal Springs	OWUS	--	Scour, benching	--	--	0.006	170.15
WET14	--	09/03/06	Lower Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland	0.03	
WET15	--	08/05/06	Lower Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland	0.02	
WET16	1	09/03/06	Lower Crystal Springs	Jurisdictional Wetland	*Eleocharis montevidensis* *Paspalum distichum*	Drift lines	Low chroma matrix with mottles	Herbaceous Wetland	0.57	
OWUS16	--	09/03/06	Lower Crystal Springs	OWUS	--	Scour, benching	--	--	0.008	115.90
WET17	--	09/03/06	Lower Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland	0.24	
WET18	--	09/03/06	Lower Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland	0.49	
WET19	--	09/03/06	Lower Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland Riparian	0.72 0.08	
OWUS19	--	09/03/06	Lower Crystal Springs	OWUS	--	Scour, benching	--	--	0.003	85.99

Appendix D: Wetlands and Other Waters of the United States Site Information

Field Team: Keven Ann Colgate, Sara Ebrahim

SITE[1]	TRANSECT[2]	SURVEY DATE	WATERBODY	JURISDICTIONAL WETLAND	DOMINANT VEGETATION[3]	PRIMARY HYDROLOGIC INDICATORS[3]	SOIL INDICATORS[3]	WETLAND COMMUNITY TYPES	JURISDICTIONAL AREA (ACRES)[5]	COMMENTS (OWUS length in feet)
WET20	--	09/03/06	Lower Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland Scirpus/Typha	0.24 0.01	
OWUS20	--	09/03/06	Lower Crystal Springs	OWUS	--	Scour, benching	--	--	0.0001	10.99
WET21	--	08/06/06	Lower Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland Scirpus/Typha	0.01 0.01	
WET22	1	07/29/06	Lower Crystal Springs	Jurisdictional Wetland	*Eleocharis montevidensis* *Phyla nodiflora* *Leontodon taraxacoides*	Drift lines	Low chroma matrix with mottles	Herbaceous Wetland	0.09	
WET23	--	08/08/06	Lower Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland	0.08	
WET24	--	08/09/06	Lower Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland	0.04	
WET25	--	08/10/06	Lower Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland	0.01	
WET26	1	08/01/06	Lower Crystal Springs	Jurisdictional Wetland	*Cyperus eragrostis* *Phyla nodiflora*	Drift lines	Low chroma matrix with mottles	Herbaceous Wetland	0.03	
WET27	--	08/01/06	Lower Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland	0.01	

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SITE[1]	TRANSECT[2]	SURVEY DATE	WATERBODY	JURISDICTIONAL WETLAND	DOMINANT VEGETATION[3]	PRIMARY HYDROLOGIC INDICATORS[3]	SOIL INDICATORS[3]	WETLAND COMMUNITY TYPES	JURISDICTIONAL AREA (ACRES)[5]	COMMENTS (OWUS length in feet)
OWUS27	--	08/01/06	Lower Crystal Springs	OWUS	--	Scour, benching	--	--	0.001	42.13
WET28	No Wetland									
OWUS28	--	08/01/06	Lower Crystal Springs	OWUS	--	Scour, benching	--	--	0.003	69.38
WET29	--	08/01/06	Lower Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland	0.06	
OWUS29	--	08/01/06	Lower Crystal Springs	OWUS	--	Scour, benching	--	--	0.01	87.83
WET30	1	08/03/06	Lower Crystal Springs	Jurisdictional Wetland	*Cyperus eragrostis* *Phyla nodiflora* *Polypogon monspeliensis*	Drift lines	Low chroma matrix with mottles	Herbaceous Wetland	0.12	
OWUS30	--	08/03/06	Lower Crystal Springs	OWUS	--	Scour, benching	--	--	0.002	37.07
WET31	--	08/03/06	Lower Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland	0.12	
OWUS31	--	08/03/06	Lower Crystal Springs	OWUS	--	Scour, benching	--	--	0.002	34.17
WET32	--	08/03/06	Lower Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland Scirpus/Typha	0.36 0.07	

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Field Team: Keven Ann Colgate, Sara Ebrahim

SITE[1]	TRANSECT[2]	SURVEY DATE	WATERBODY	JURISDICTIONAL WETLAND	DOMINANT VEGETATION[3]	PRIMARY HYDROLOGIC INDICATORS[3]	SOIL INDICATORS[3]	WETLAND COMMUNITY TYPES	JURISDICTIONAL AREA (ACRES)[5]	COMMENTS (OWUS length in feet)
OWUS32	--	08/03/06	Lower Crystal Springs	OWUS	--	Scour, benching	--	--	0.006	82.89
WET33	--	08/03/06	Lower Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines, benching	Wetland Soils Assumed	Herbaceous Wetland Scirpus/Typha Riparian	0.67 0.20 0.40	
OWUS33 A	--	08/03/06	Lower Crystal Springs	OWUS	--	Scour, benching	--	--	1.08	2956.19
OWUS33 B	--	08/03/06	Lower Crystal Springs	OWUS	--	Scour, benching	--	--	0.002	45.85
WET34	--	08/03/06	Lower Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Gleyed or low chroma colors	Herbaceous Wetland	0.06	
OWUS34	--	08/03/06	Lower Crystal Springs	OWUS	--	Scour, benching	--	--	0.04	139.13
WET35	--	08/03/06	Lower Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland	0.14	
OWUS35	--	08/03/06	Lower Crystal Springs	OWUS	--	Scour, benching	--	--	0.02	184.64
WET36	--	08/03/06	Lower Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland	0.04	

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Field Team: Keven Ann Colgate, Sara Ebrahim

SITE[1]	TRANSECT[2]	SURVEY DATE	WATERBODY	JURISDICTIONAL WETLAND	DOMINANT VEGETATION[3]	PRIMARY HYDROLOGIC INDICATORS[3]	SOIL INDICATORS[3]	WETLAND COMMUNITY TYPES	JURISDICTIONAL AREA (ACRES)[3]	COMMENTS (OWUS length in feet)
OWUS36	--	08/03/06	Lower Crystal Springs	OWUS	--	Scour, benching	--	--	0.008	92.10
WET37	--	08/03/06	Lower Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland	0.03	
OWUS37	--	08/03/06	Lower Crystal Springs	OWUS	--	Scour, benching	--	--	0.005	49.92
WET38	1	08/03/06	Lower Crystal Springs	Jurisdictional Wetland	*Juncus mexicanus* *Eleocharis montevedensis*	Drift lines	Low chroma matrix with mottles	Herbaceous Wetland	0.64	
WET39	--	08/03/06	Lower Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland Scirpus/Typha	0.08 0.01	
OWUS39	--	08/03/06	Lower Crystal Springs	OWUS	--	Scour, benching	--	--	0.02	162.57
WET40	--	08/03/06	Lower Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland	0.41	
WET41	--	08/03/06	Lower Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland Scirpus/Typha	0.02 0.004	
WET42	1	09/03/06	Lower Crystal Springs	Jurisdictional Wetland	*Cynodon dactylon*	Drift lines	Low chroma matrix	Herbaceous Wetland	0.23	

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SITE[1]	TRANSECT[2]	SURVEY DATE	WATERBODY	JURISDICTIONAL WETLAND	DOMINANT VEGETATION[3]	PRIMARY HYDROLOGIC INDICATORS[3]	SOIL INDICATORS[3]	WETLAND COMMUNITY TYPES	JURISDICTIONAL AREA (ACRES)[5]	COMMENTS (OWUS length in feet)
WET43	--	09/03/06	Lower Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland	0.003	
WET44	--	09/03/06	Lower Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland	0.005	
WET45	--	09/03/06	Lower Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland Riparian	0.03 0.01	
WET46	--	09/03/06	Lower Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland Scirpus/Typha Riparian	0.02 0.01 0.06	
WET47	--	09/03/06	Lower Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland	0.08	
WET48	--	09/03/06	Lower Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland	0.11	
WET49	1	09/03/06	Lower Crystal Springs	Jurisdictional Wetland	*Scirpus acutus*	Inundated	Aquic moisture regime	Herbaceous Wetland Scirpus/Typha	0.03 0.01	
WET50	--	09/03/06	Lower Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland	0.05	
WET51	1	08/04/06	Lower Crystal Springs	Jurisdictional Wetland	*Juncus mexicanus*	Drift lines	Low chroma matrix with mottles	Herbaceous Wetland	2.82	

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SITE[1]	TRANSECT[2]	SURVEY DATE	WATERBODY	JURISDICTIONAL WETLAND	DOMINANT VEGETATION[3]	PRIMARY HYDROLOGIC INDICATORS[3]	SOIL INDICATORS[3]	WETLAND COMMUNITY TYPES	JURISDICTIONAL AREA (ACRES)[3]	COMMENTS (OWUS length in feet)
WET52	--	08/04/06	Lower Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland Scirpus/Typha	0.24 0.004	
OWUS52	--	08/04/06	Lower Crystal Springs	OWUS	--	Scour, benching	--	--	0.004	100.79
WET53	--	08/04/06	Lower Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland	0.29	
OWUS53	--	08/04/06	Lower Crystal Springs	OWUS	--	Scour, benching	--	--	0.05	302.38
WET54	--	08/01/06	Lower Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland	0.01	
OWUS54	--	08/01/06	Lower Crystal Springs	OWUS	--	Scour, benching	--	--	0.002	65.60
WET55	--	08/01/06	Lower Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland Scirpus/Typha	0.03 0.005	
OWUS55	--	08/01/06	Lower Crystal Springs	OWUS	--	Scour, benching	--	--	0.002	35.72

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SITE[1]	TRANSECT[2]	SURVEY DATE	WATERBODY	JURISDICTIONAL WETLAND	DOMINANT VEGETATION[3]	PRIMARY HYDROLOGIC INDICATORS[3]	SOIL INDICATORS[3]	WETLAND COMMUNITY TYPES	JURISDICTIONAL AREA (ACRES)[5]	COMMENTS (OWUS length in feet)
WET56	--	08/01/06	Lower Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland Riparian	0.01 0.01	
WET57	--	08/01/06	Lower Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland	0.01	
OWUS57	--	08/01/06	Lower Crystal Springs	OWUS	--	Scour, benching	--	--	0.004	39.62
WET58	1	08/01/06	Lower Crystal Springs	Jurisdictional Wetland	*Phyla nodiflora* *Paspalum distichum*	Drift lines	Gleyed or low chroma colors	Herbaceous Wetland Scirpus/Typha	0.15 0.002	
OWUS58	--	08/01/06	Lower Crystal Springs	OWUS	--	Scour, benching	--	--	0.01	77.63
WET59	1	08/01/06	Lower Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Scirpus/Typha Riparian	0.004 0.24	
WET60	--	08/01/06	Lower Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM	Wetland Soils Assumed	Herbaceous Wetland	0.14	Patches of *Paspalum distichum* at higher elevation than Freshwater March typically found - found in Vernal Wetland elevation.
WET61	--	08/04/06	Lower Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland	0.18	
OWUS61	--	08/04/06	Lower Crystal Springs	OWUS	--	Scour, benching	--	--	0.01	86.73 ft x 4.5 ft

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SITE[1]	TRANSECT[2]	SURVEY DATE	WATERBODY	JURISDICTIONAL WETLAND	DOMINANT VEGETATION[3]	PRIMARY HYDROLOGIC INDICATORS[3]	SOIL INDICATORS[3]	WETLAND COMMUNITY TYPES	JURISDICTIONAL AREA (ACRES)[3]	COMMENTS (OWUS length in feet)
WET62	1	08/04/06	Lower Crystal Springs	Jurisdictional Wetland	*Phyla nodiflora* *Cyperus eragrostis* *Gnaphalium luteo-album* *Paspalum distichum*	Drift lines	Low chroma matrix with mottles	Herbaceous Wetland	0.08	
WET63	--	08/04/06	Lower Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM	Wetland Soils Assumed	Herbaceous Wetland	0.03	
OWUS63	--	08/04/06	Lower Crystal Springs	OWUS	--	Scour, benching	--	--	0.004	183.97
WET64	1	08/04/06	Lower Crystal Springs	Jurisdictional Wetland	*Juncus mexicanus*	Drift lines	Low chroma matrix with mottles	Herbaceous Wetland	2.86	
OWUS64	--	08/04/06	Lower Crystal Springs	OWUS	--	Scour, benching, drift lines	--	--	0.025	301.47
WET65	--	08/04/06	Lower Crystal Springs	Jurisdictional Wetland	Wetland Communities	Saturated in the Upper 12", or within the OHWM	Wetland Soils Assumed	Herbaceous Wetland Scirpus/Typha Riparian	1.23 0.30 1.48	Depression vegetated with arroyo willow fed by upslope drainage
WET66	--	08/04/06	Lower Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland	0.06	
WET67	--	08/04/06	Lower Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland Scirpus/Typha	0.37 0.20	
WET68	1	08/04/06	Lower Crystal Springs	Jurisdictional Wetland	*Polypogon monspeliensis* *Phyla nodiflora* *Leontodon taraxacoides*	Drift lines	Low chroma matrix with mottles	Herbaceous Wetland Scirpus/Typha	1.44 0.13	

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SITE[1]	TRANSECT[2]	SURVEY DATE	WATERBODY	JURISDICTIONAL WETLAND	DOMINANT VEGETATION[3]	PRIMARY HYDROLOGIC INDICATORS[3]	SOIL INDICATORS[3]	WETLAND COMMUNITY TYPES	JURISDICTIONAL AREA (ACRES)[3]	COMMENTS (OWUS length in feet)
OWUS68	--	08/04/06	Lower Crystal Springs	OWUS	--	Scour, benching	--	--	0.003	38.22
WET69	--	07/27/06 7/30/06 08/04/06	Lower Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland	0.02	Atypical - Causeway (rip-rap) and boat launch construction
WET70	1	08/01/06	Lower Crystal Springs	Jurisdictional Wetland	*Paspalum distichum* *Mentha pulegium* *Xanthium strumarium* *Polypogon monspeliensis*	Drift lines	Low chroma matrix	Herbaceous Wetland Scirpus/Typha	0.31 0.001	
WET71	--	08/01/06	Lower Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland	0.09	
WET72	--	08/01/06	Lower Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland Scirpus/Typha	2.39 0.11	
OWUS72	--	7/30/2006	Lower Crystal Springs	OWUS	--	Scour, benching	--	--	0.001	30.07
WET73	1	07/30/06	Lower Crystal Springs	Jurisdictional Wetland	*Cirsium fontinale* *Juncus mexicanus* *Mimulus guttatus* *Pinus radiata* *Baccharis douglasii*	Saturated in the Upper 12"	Low chroma matrix	Herbaceous Wetland Scirpus/Typha	9.11 1.37	Hillside seep - special-status thistle patch
	2				*Juncus mexicanus* *Rumex crispus*	Drift lines	Low chroma matrix			
OWUS73		7/30/2006	Lower Crystal Springs	OWUS	--	Scour, benching	--	--	0.003	47.72
WET74	1	07/30/06	Lower Crystal Springs	Jurisdictional Wetland	*Polypogon monspeliensis* *Paspalum distichum* *Phyla nodiflora* *Juncus mexicanus* *Helenium bigelovii*	Drift lines	Low chroma matrix	Herbaceous Wetland Scirpus/Typha	0.52 0.12	
	2				*Polygonum amphibium*		Greater than 90% cover by OBL			

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SITE[1]	TRANSECT[2]	SURVEY DATE	WATERBODY	JURISDICTIONAL WETLAND	DOMINANT VEGETATION[3]	PRIMARY HYDROLOGIC INDICATORS[3]	SOIL INDICATORS[3]	WETLAND COMMUNITY TYPES	JURISDICTIONAL AREA (ACRES)[3]	COMMENTS (OWUS length in feet)
WET75	1	07/30/06	Lower Crystal Springs	Jurisdictional Wetland	*Polygonum amphibium* *Paspalum dilatatum* *Phyla nodiflora* *Scirpus cernuus* *Cyperus eragrostis*	Drift lines	Low chroma matrix with mottles	Herbaceous Wetland	0.02	
WET76	--	09/04/06 09/05/06	Upper Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland Scirpus/Typha	1.53 0.31	Atypical - Causeway (rip-rap) and boat launch construction
WET77	1	09/04/06	Upper Crystal Springs	Jurisdictional Wetland	*Euthamia occidentalis* *Scirpus acutus* *Stachys bullata* *Mentha pulegium* *Polypogon monspeliensis*	Drift lines	Low chroma matrix	Herbaceous Wetland Scirpus/Typha	1.00 0.14	Atypical - Causeway (rip-rap) and boat launch construction
OWUS77	--	09/04/06	Upper Crystal Springs	OWUS	--	Scour, benching	--	--	0.001	19.12
WET78	--	09/04/06	Upper Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland Scirpus/Typha	0.71 0.09	
WET79	--	09/04/06	Upper Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland Scirpus/Typha	0.27 0.09	
WET80	--	09/04/06	Upper Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland	0.12	
WET81	1	09/04/06	Upper Crystal Springs	Jurisdictional Wetland	*Cynodon dactylon*	Drift lines	Low chroma matrix	Herbaceous Wetland	0.31	
WET82	--	09/04/06	Upper Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland	0.61	

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SITE[1]	TRANSECT[2]	SURVEY DATE	WATERBODY	JURISDICTIONAL WETLAND	DOMINANT VEGETATION[3]	PRIMARY HYDROLOGIC INDICATORS[3]	SOIL INDICATORS[3]	WETLAND COMMUNITY TYPES	JURISDICTIONAL AREA (ACRES)[3]	COMMENTS (OWUS length in feet)
OWUS82	--	09/04/06	Upper Crystal Springs	OWUS	--	Scour, benching	--	--	0.00005	0.63
WET83	--	09/04/06	Upper Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland Scirpus/Typha Riparian	0.09 0.001 0.03	
OWUS83	--	09/04/06	Upper Crystal Springs	OWUS	--	Scour, benching	--	--	0.0004	7.43
WET84	--	09/04/06	Upper Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland Scirpus/Typha	1.04 0.05	
WET85	1	09/04/06	Upper Crystal Springs	Jurisdictional Wetland	*Juncus balticus* *Polygonum amphibium*	Drift lines, saturated in upper 12"	Low chroma matrix	Herbaceous Wetland Scirpus/Typha	1.41 0.27	
WET86	1	09/04/06	Upper Crystal Springs	Jurisdictional Wetland	*Equisetum arvense*	Drift lines	Low chroma matrix with mottles	Herbaceous Wetland	0.08	
WET87	1	09/05/06	Upper Crystal Springs	Jurisdictional Wetland	*Phyla nodiflora* *Eleocharis montevidensis* *Cyperus eragrostis* *Mentha pulegium* *Paspalum distichum*	Drift lines	Low chroma matrix with mottles	Herbaceous Wetland Scirpus/Typha	0.22 0.02	
WET88	--	09/05/06	Upper Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland Scirpus/Typha Riparian	0.24 0.16 0.005	
OWUS88	--	09/05/06	Upper Crystal Springs	OWUS	--	Scour, benching	--	--	0.004	51.07

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SITE[1]	TRANSECT[2]	SURVEY DATE	WATERBODY	JURISDICTIONAL WETLAND	DOMINANT VEGETATION[3]	PRIMARY HYDROLOGIC INDICATORS[3]	SOIL INDICATORS[3]	WETLAND COMMUNITY TYPES	JURISDICTIONAL AREA (ACRES)[5]	COMMENTS (OWUS length in feet)
WET89	1	09/05/06	Upper Crystal Springs	Jurisdictional Wetland	*Eleocharis montevedensis* *Juncus mexicanus*	Drift lines	Low chroma matrix with mottles	Herbaceous Wetland Scirpus/Typha	0.87 0.18	
OWUS89	--	03/09/07	Upper Crystal Springs	OWUS	--	Scour, benching	--	--	0.70	1848.31
OWUS90	--	03/09/07	Upper Crystal Springs	OWUS	--	Scour, benching	--	--	0.01	152.67
WET90	--	09/05/06	Upper Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland Scirpus/Typha Riparian	3.77 0.51 0.25	
WET91	1	09/05/06	Upper Crystal Springs	Jurisdictional Wetland	*Phyla nodiflora* *Polypogon monspeliensis* *Unknown grass* *Lythrum tribracteum*	Drift lines, benching	Low chroma matrix with mottles	Herbaceous Wetland Scirpus/Typha	2.90 0.20	
WET92	--	09/05/06	Upper Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland Scirpus/Typha	0.14 0.01	
WET93	--	09/05/06	Upper Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland Scirpus/Typha	0.80 0.41	
WET94	1	09/06/06	Upper Crystal Springs	Jurisdictional Wetland	*Phyla nodiflora* *Cyperus eragrostis* *Mentha pulegium* *Paspalum distichum* *Equisetum arvense*	Drift lines	Low chroma matrix with mottles	Herbaceous Wetland Scirpus/Typha	0.24 0.01	
WET95	--	09/06/06	Upper Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland Scirpus/Typha	0.07 0.01	
WET96	--	09/06/06	Upper Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland	0.13	

Appendix D: Wetlands and Other Waters of the United States Site Information

Field Team: Keven Ann Colgate, Sara Ebrahim

SITE[1]	TRANSECT[2]	SURVEY DATE	WATERBODY	JURISDICTIONAL WETLAND	DOMINANT VEGETATION[3]	PRIMARY HYDROLOGIC INDICATORS[3]	SOIL INDICATORS[3]	WETLAND COMMUNITY TYPES	JURISDICTIONAL AREA (ACRES)[5]	COMMENTS (OWUS length in feet)
WET97	1-PIT B	09/05/06	Upper Crystal Springs	Jurisdictional Wetland	*Baccharis douglasii* *Euthamia occidentalis* *Helenium bigelovii*	Drainage patterns in wetlands	Low chroma matrix	Herbaceous Wetland Scirpus/Typha Riparian	9.95 3.80 15.88	Extensive arroyo willow forest in topographical depression. Area receives water from upslope drainages.
	1-PIT C	09/05/06			*Salix lasiolepis* *Oenanthe sarmentosa* *Helenium bigelovii* *Rubus ursinus*	Drainage patterns in wetlands	Aquic Moisture Regime			
	2	09/06/06			*Phyla nodiflora* *Mentha pulegium* *Gnaphalium palustre* *Lolium multiflorum* *Cyperus eragrostis*	Drift lines	Low chroma matrix with mottles			
	3	09/06/06			*Phyla nodiflora* *Lolium multiflorum* *Unknown grass* *Mentha pulegium* *Rumex crispus*	Drift lines	Low chroma matrix with mottles			
WET98	--	09/06/06	Upper Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland	0.09	Wetlands intermittent along steep bank of Adobe Gulch
WET99	--	09/06/06	Upper Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland	0.06	

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SITE[1]	TRANSECT[2]	SURVEY DATE	WATERBODY	JURISDICTIONAL WETLAND	DOMINANT VEGETATION[3]	PRIMARY HYDROLOGIC INDICATORS[3]	SOIL INDICATORS[3]	WETLAND COMMUNITY TYPES	JURISDICTIONAL AREA (ACRES)[5]	COMMENTS (OWUS length in feet)
WET100	1	09/06/06	Upper Crystal Springs	Jurisdictional Wetland	*Paspalum distichum* *Eleocharis montevedensis*	Drift lines	Wetland Soils Assumed	Herbaceous Wetland Scirpus/Typha Riparian	36.82 2.25 11.32	Extensive arroyo willow forest in topographical depression. Area receives water from upslope drainages.
	2	07/28/06			*Leymus triticoides* *Phyla nodiflora* *Cyperus eragrostis* *Rumex crispus*	Drift lines	Low chroma matrix with mottles			
	3	09/06/06			*Paspalum distichum* *Eleocharis montevedensis*	Drift lines	Wetland Soils Assumed			
	4	07/28/06			*Phyla nodiflora* *Lotus corniculatus* *Cyperus eragrostis* *Helenium bigelovii* *Centaurium muehlenbergii*	Drift lines	Low chroma matrix with mottles			
	5	07/28/06			*Lolium multiflorum* *Phyla nodiflora* *Lotus corniculatus* *Mentha pulegium* *Polypogon monspeliensis*	Drift lines	Low chroma matrix with mottles			
WET101	--	09/06/06	Upper Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland	1.57	

Appendix D: Wetlands and Other Waters of the United States Site Information

Field Team: Keven Ann Colgate, Sara Ebrahim

SITE[1]	TRANSECT[2]	SURVEY DATE	WATERBODY	JURISDICTIONAL WETLAND	DOMINANT VEGETATION[3]	PRIMARY HYDROLOGIC INDICATORS[3]	SOIL INDICATORS[3]	WETLAND COMMUNITY TYPES	JURISDICTIONAL AREA (ACRES)[5]	COMMENTS (OWUS length in feet)
WET102	1	09/06/06	Upper Crystal Springs	Jurisdictional Wetland	*Juncus mexicanus* *Euthamia occidentalis*	Drift lines	Low chroma matrix with mottles	Herbaceous Wetland Scirpus/Typha Riparian	39.16 8.32 12.75	Extensive arroyo willow forest in topographical depression.
	2-PIT B	07/28/06			*Juncus bufonius* *Mentha pulegium* *Phyla nodiflora* *Lythrum tribracteum* *Polypogon monspeliensis*	Drift lines	Low chroma matrix with mottles			
	2-PITC	07/28/06			*Phyla nodiflora* *Polypogon monspeliensis* *Mentha pulegium* *Scirpus cernuus*	Drift lines	Wetland Soils Assumed			
	3	07/28/06			*Phyla nodiflora* *Cyperus eragrostis* *Mentha pulegium* *Juncus bufonius*	Drift lines	Low chroma matrix with mottles			
	4	09/06/06			*Salix lasiolepis* *Rubus ursinus*	Drift lines	Low chroma matrix with mottles			
	5	09/06/06			*Phyla nodiflora* *Rumex crispus* *Cyperus eragrostis* *Eleocharis montevedensis* *Scirpus cernuus*	Drift lines	Low chroma matrix with mottles			
	6	07/28/06			*Eleocharis montevedensis* *Juncus mexicanus*	Saturated in the Upper 12"	Low chroma matrix			
WET103	1	09/04/06	Upper Crystal Springs	Jurisdictional Wetland	*Euthamia occidentalis* *Phyla nodiflora* *Mentha pulegium*	Drift lines	Low chroma matrix with mottles	Herbaceous Wetland Scirpus/Typha	7.07 0.11	

Appendix D: Wetlands and Other Waters of the United States Site Information

Field Team: Keven Ann Colgate, Sara Ebrahim

SITE[1]	TRANSECT[2]	SURVEY DATE	WATERBODY	JURISDICTIONAL WETLAND	DOMINANT VEGETATION[3]	PRIMARY HYDROLOGIC INDICATORS[3]	SOIL INDICATORS[3]	WETLAND COMMUNITY TYPES	JURISDICTIONAL AREA (ACRES)[3]	COMMENTS (OWUS length in feet)
WET104	--	09/04/06	Upper Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland Scirpus/Typha Riparian	6.78 0.22 0.57	
WET105	1	07/31/06	Upper Crystal Springs	Jurisdictional Wetland	*Phyla nodiflora* *Paspalum distichum* *Euthamia occidentalis*	Drift lines	Low chroma matrix with mottles	Herbaceous Wetland	0.98	
WET106	--	07/31/06	Upper Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland	0.02	
WET107	--	07/31/06	Upper Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland Riparian	0.02 0.003	Hydrology - water from a seep
WET108	--	07/31/06	Upper Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland Scirpus/Typha	0.44 0.01	
WET109	1	07/31/06	Upper Crystal Springs	Jurisdictional Wetland	*Salix exigua*	Drift lines	Low chroma matrix	Herbaceous Wetland Scirpus/Typha Riparian	0.26 0.02 0.18	
WET110	--	07/31/06	Upper Crystal Springs	Jurisdictional Wetland	Wetland Communities	Within OHWM, drift lines	Wetland Soils Assumed	Herbaceous Wetland Scirpus/Typha	0.48 0.01	

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Field Team: Keven Ann Colgate, Sara Ebrahim

SITE[1]	TRANSECT[2]	SURVEY DATE	WATERBODY	JURISDICTIONAL WETLAND	DOMINANT VEGETATION[3]	PRIMARY HYDROLOGIC INDICATORS[3]	SOIL INDICATORS[3]	WETLAND COMMUNITY TYPES	JURISDICTIONAL AREA (ACRES)[5]	COMMENTS (OWUS length in feet)
WET111	1	07/31/06	Upper Crystal Springs	Jurisdictional Wetland	*Carex spp.* *Polygonum amphibium*	Drift lines, scour	Wetland Soils Assumed	Herbaceous Wetland Scirpus/Typha Riparian	31.89 1.34 9.26	
	2				*Lythrum tribracteatum* *Stachys bullata* *Navarretia pubescens* *Gnaphalium palustre* *Juncus mexicanus*	Drift lines	Low chroma matrix			
	3				*Mentha pulegium* *Euthamia occidentalis* *Phyla nodiflora* *Polypogon monspeliensis*	Drift lines	Low chroma matrix with mottles			
	4				*Salix exigua* *Cyperus eragrostis*	Drift lines	Low chroma matrix with mottles			
WET SW1	1	08/02/06	Spillway	Jurisdictional Wetland	*Oenanthe sarmentosa* *Salix lasiolepis* *Rubus ursinus*	Saturated in the Upper 12"	Low chroma matrix	Herbaceous Wetland Riparian	0.01 0.21	Wetland area = 14,898.9 square feet (0.0228 acres)
	2				*Polygonum punctatum* *Oenanthe sarmentosa* *Toxicodendron diversilobum* *Rubus ursinus* *Salix lucida*	Saturated in the Upper 12"	Gleyed or low chroma colors			
OWUS SW 1A	--	08/02/06	Spillway	OWUS	--	Inundated	--	--	0.06	60 ft x 40 ft
WET SW2	1	08/02/06	Spillway	Jurisdictional Wetland	*Oenanthe sarmentosa* *Juncus balticus* *Juncus xiphioides* *Fragaria vesca*	Inundated	Greater than 90% cover by OBL	Herbaceous Wetland (Freshwater Seep)	0.02	Wetland area = 823.3 square feet (0.019 acres)
s	1	06/09/07	Potential Mitigation Site	Jurisdictional Wetland	*Typha dominguensis* *Scirpus cernuus* *Juncus patens* *Salix lasiolepis*	Ponding, saturated in the upper 12 inches	generally rock - further investigation needed	Herbaceous Wetland Scirpus/Typha Riparian	3.59	
	2				*Typha dominguensis* *Scirpus cernuus* *Epilobium ciliatum* *Polypogon monspelianus*					
PM WET 2		06/09/07	Potential Mitigation Site	Jurisdictional Wetland	*Salix lasiolepis* *Rubus ursinus* *Scirpus cernuus*	Watermarks, drift lineswater-stained leaves	Low chroma matrix	Riparian	0.07	

Appendix D: Wetlands and Other Waters of the United States Site Information

Field Team: Keven Ann Colgate, Sara Ebrahim

SITE[1]	TRANSECT[2]	SURVEY DATE	WATERBODY	JURISDICTIONAL WETLAND	DOMINANT VEGETATION[3]	PRIMARY HYDROLOGIC INDICATORS[3]	SOIL INDICATORS[3]	WETLAND COMMUNITY TYPES	JURISDICTIONAL AREA (ACRES)[3]	COMMENTS (OWUS length in feet)
PM WET 3		06/09/07	Potential Mitigation Site	Jurisdictional Wetland	*Salix lasiolepis*	Watermarks, water-stained leaves	Low chroma matrix with mottles	Riparian	0.04	
PM WET 4		06/09/07	Potential Mitigation Site	Jurisdictional Wetland	*Euthamnia occidentalis* *Polypogon monspelianus* *Juncus mexicanus* *Rumex* sp. *Erigeron sp.*	Watermarks, driftlines	Low chroma matrix	Herbaceous Wetland	0.01	

[1] Wetland sites are labeled "Wet#"; other waters of the U.S. are labeled "OWUS#". Wetland and other waters with the same number are hydrologically connected. Letter A, B, C, etc. is added to the OWUS# if there are multiple OWUS per wetland.

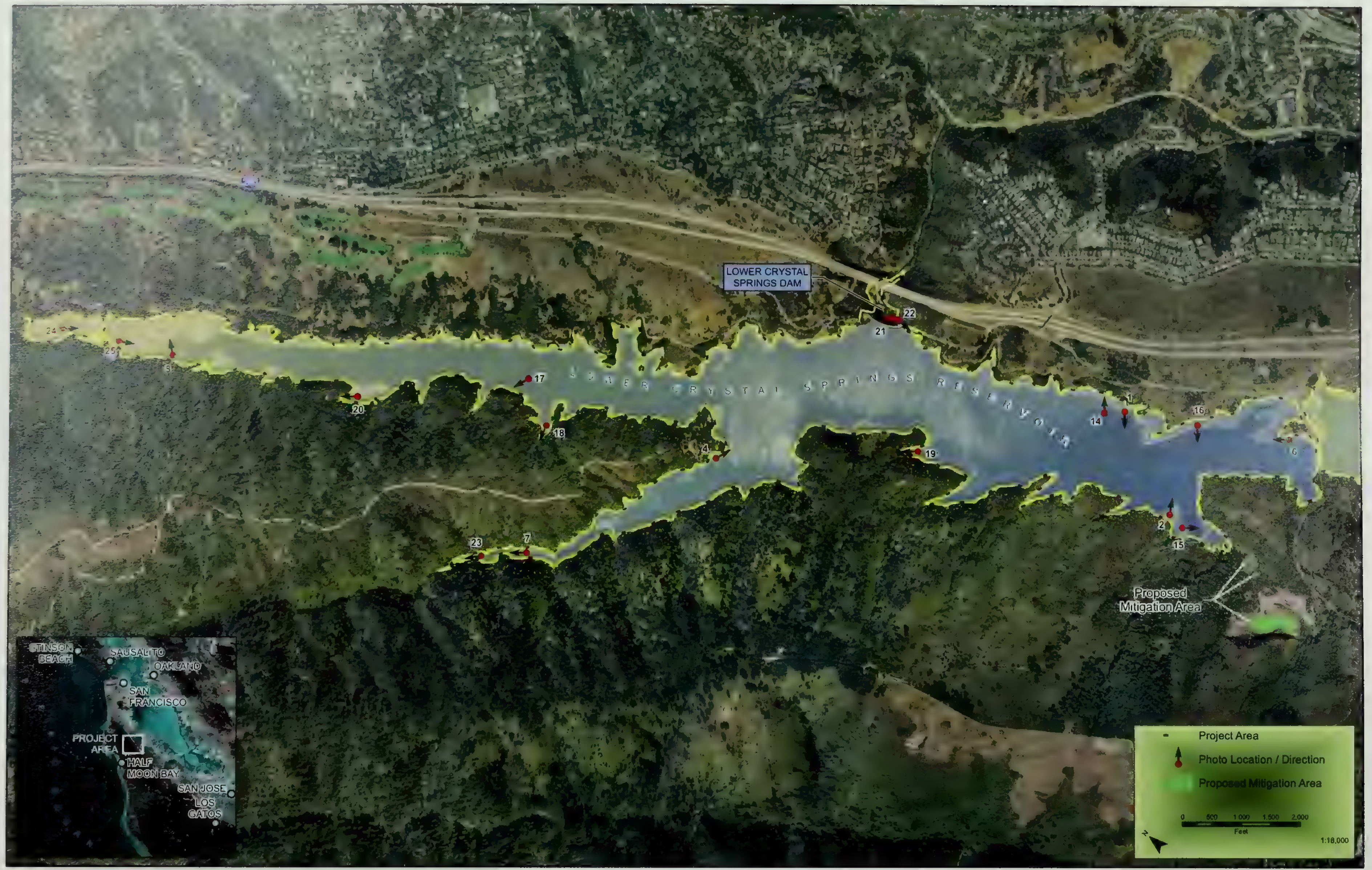
[2] Routine Wetland Determination Data Forms are provided for wetlands with transect numbers; if more than one wetland pit per transect was recorded, the transect number references the appropriate wetland pit (i.e., PIT B or PIT C); PIT A always represents the adjacent non-wetland community.

[3] Site specific vegetation species, hydrology and soils information is not included for wetland areas connected to, or directly adjacent to wetland investigation sites (i.e., wetland transects); information on the wetland communities present in these areas is included in this table.

[4] Area (in acres) for OWUS and WET polygons within the project area were generated by a query of the GIS data base. Acreages reported for wetland (i.e., "WET") sites represent potentially jurisdictional wetlands. Acreages reported for Other Waters of the U.S. sites (i.e., "OWUS) represent potentially jurisdictional riverine other waters of the U.S.

Appendix E

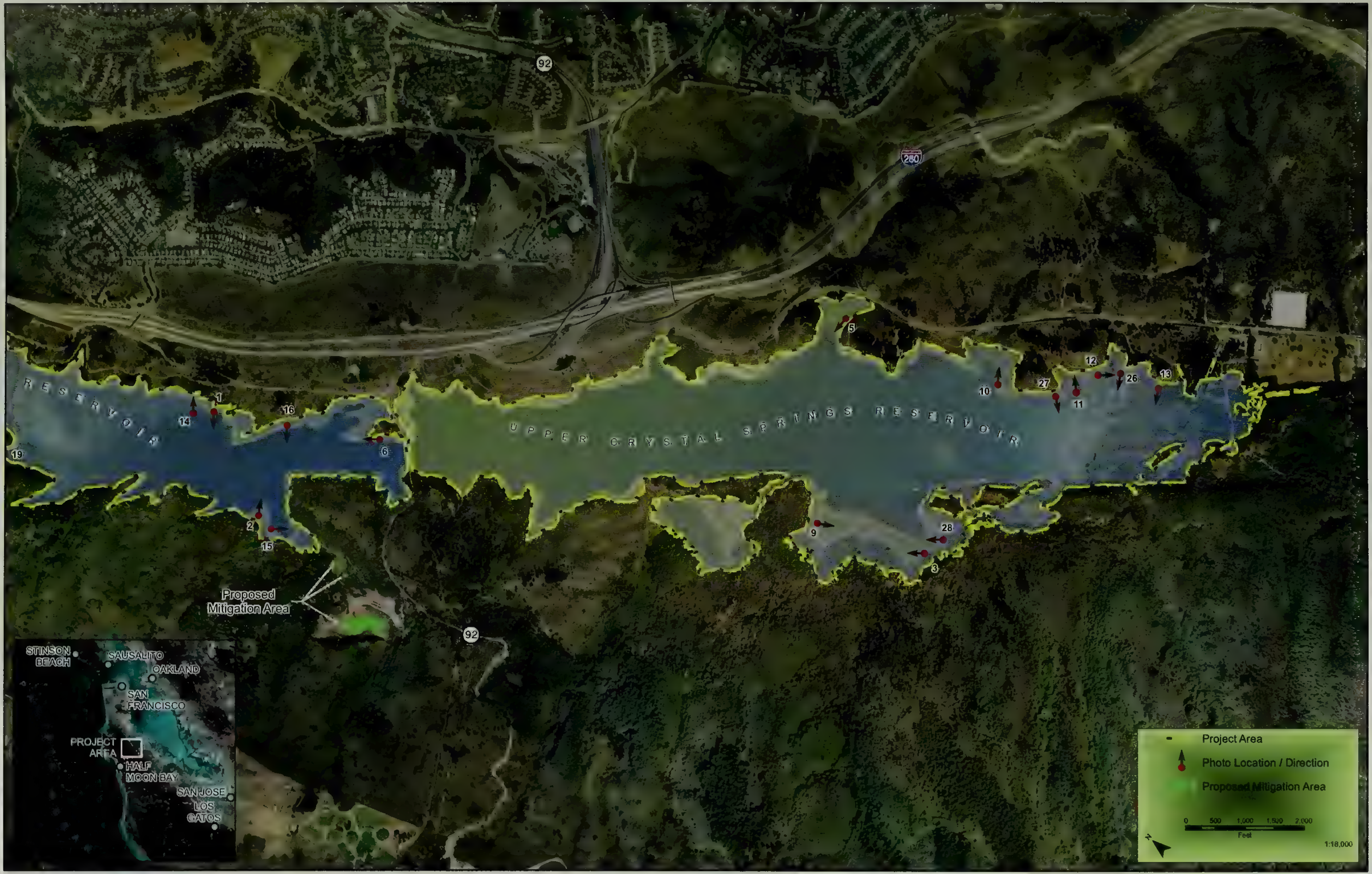
Photographs of Wetland and OWUS Study Sites



Lower Crystal Springs Dam Improvements Project Wetland Delineation Report

Appendix E : Map 1 of 2

Lower Crystal Springs Reservoir - Photo Locations



Lower Crystal Springs Dam Improvements Project Wetland Delineation Report

Appendix E : Map 2 of 2

Lower Crystal Springs Reservoir - Photo Locations

PHOTO 1: Vernal wetland dominated by Mexican rush (*Juncus mexicanus* [FACW]), pennyroyal (*Mentha pulegium* [OBL]), tall flatsedge (*Cyperus eragrostis* [FACW]), and annual beard grass (*Polypogon monspeliensis* [FACW+]).

PHOTO 2: Freshwater marsh wetland community dominated by sand spikerush (*Eleocharis montevidensis* [FACW]) with vernal wetland dominated by Mexican rush (*Juncus mexicanus* [FACW]) in the foreground.

PHOTO 3: Freshwater marsh dominated by sand spikerush (*Eleocharis montevidensis* [FACW]) with an arroyo willow (*Salix lasiolepis* [FACW]) dominated riparian stand in the background.

PHOTO 4: Freshwater marsh dominated by annual tule (*Scirpus cernuus* [OBL]).

PHOTO 5: Perennial amphibious wetland community dominated by water smartweed (*Polygonum amphibium* [OBL]).

PHOTO 6: Perennial Amphibious wetland community dominated by knotgrass (*Paspalum distichum* [OBL]).

PHOTO 7: Perennial aquatic wetland community dominated by variableleaf pondweed (*Potamogeton gramineus* [OBL]).

PHOTO 8: Perennial aquatic wetland dominated by parrot's feather (*Myriophyllum aquaticum* [OBL]).

PHOTO 9: Freshwater marsh and arroyo willow wetland communities. Dominants are bulrush (*Scirpus* spp. [OBL]), Mexican rush (*Juncus mexicanus* [FACW]) and sand spikerush (*Eleocharis montevidensis* [FACW]). Arroyo willow (*Salix lasiolepis* [FACW]) stands occupy the upper margins of the wetland on photo right.

PHOTO 10: Perennial aquatic and amphibious wetlands intergrading with freshwater marsh and vernal wetland communities. Dominants include hardstem bulrush (*Scirpus acutus* [OBL]), and sand spikerush (*Eleocharis montevidensis* [FACW]). Sandbar willow (*Salix exigua* [OBL]) is the small silver tree in the background.

PHOTO 11: A small patch of sandbar willow (*Salix exigua* [OBL]) dominated wetland.

PHOTO 12: Perennial aquatic and perennial amphibious wetlands intergrading with freshwater marsh and sandbar willow stands. Dominants include water smartweed (*Polygonum amphibium* [OBL]), hardstem bulrush (*Scirpus acutus* [OBL]), sand spikerush (*Eleocharis montevidensis* [FACW]), and sandbar willow (*Salix exigua* [OBL]) forming a large monotypic stand in the background.

PHOTO 13: Arroyo willow (*Salix lasiolepis* [FACW]) and sandbar willow (*Salix exigua* [OBL]) stands intergrading at the south end of Upper Crystal Springs Reservoir.

PHOTO 14: Wetland area dominated by arroyo willow (*Salix lasiolepis* [FACW]).

PHOTO 15: Perennial aquatic wetland intergrading with freshwater marsh and arroyo willow stands. Dominants include parrot's feather (*Myriophyllum aquaticum* [OBL]), California tule (*Scirpus californicus* [OBL]), and arroyo willow (*Salix lasiolepis* [FACW]) forming a large monotypic stand on photo right.

PHOTO 16: Freshwater seep dominated by fountain thistle (*Cirsium fontinale* [OBL]) and seep monkey flower (*Mimulus guttatus* [OBL]).

PHOTO 17: Other waters of the United States – lacustrine.

PHOTO 18: Other waters of the United States – riverine.

PHOTO 19: Other waters of the United States – riverine.

PHOTO 20: Other waters of the United States – riverine.

PHOTO 21: Panicled bulrush (*Scirpus microcarpus* [OBL]), cattail (*Typha* sp. [OBL]) and (*Salix lasiolepis* [FACW]) at the base of the Lower Crystal Springs Dam spillway.

PHOTO 22: Freshwater seep wetland community on the south side of the Lower Crystal Springs Dam.

PHOTO 23: Freshwater wetlands and unvegetated other waters of the United States located at the north tip of the western finger of Lower Crystal Springs Reservoir.

PHOTO 24: Vernal wetland communities at Tracy Lake located north of Lower Crystal Springs Reservoir.

PHOTO 25: Vernal wetlands intergrading with freshwater marsh and perennial aquatic communities located at the north tip of Lower Crystal Springs Reservoir.

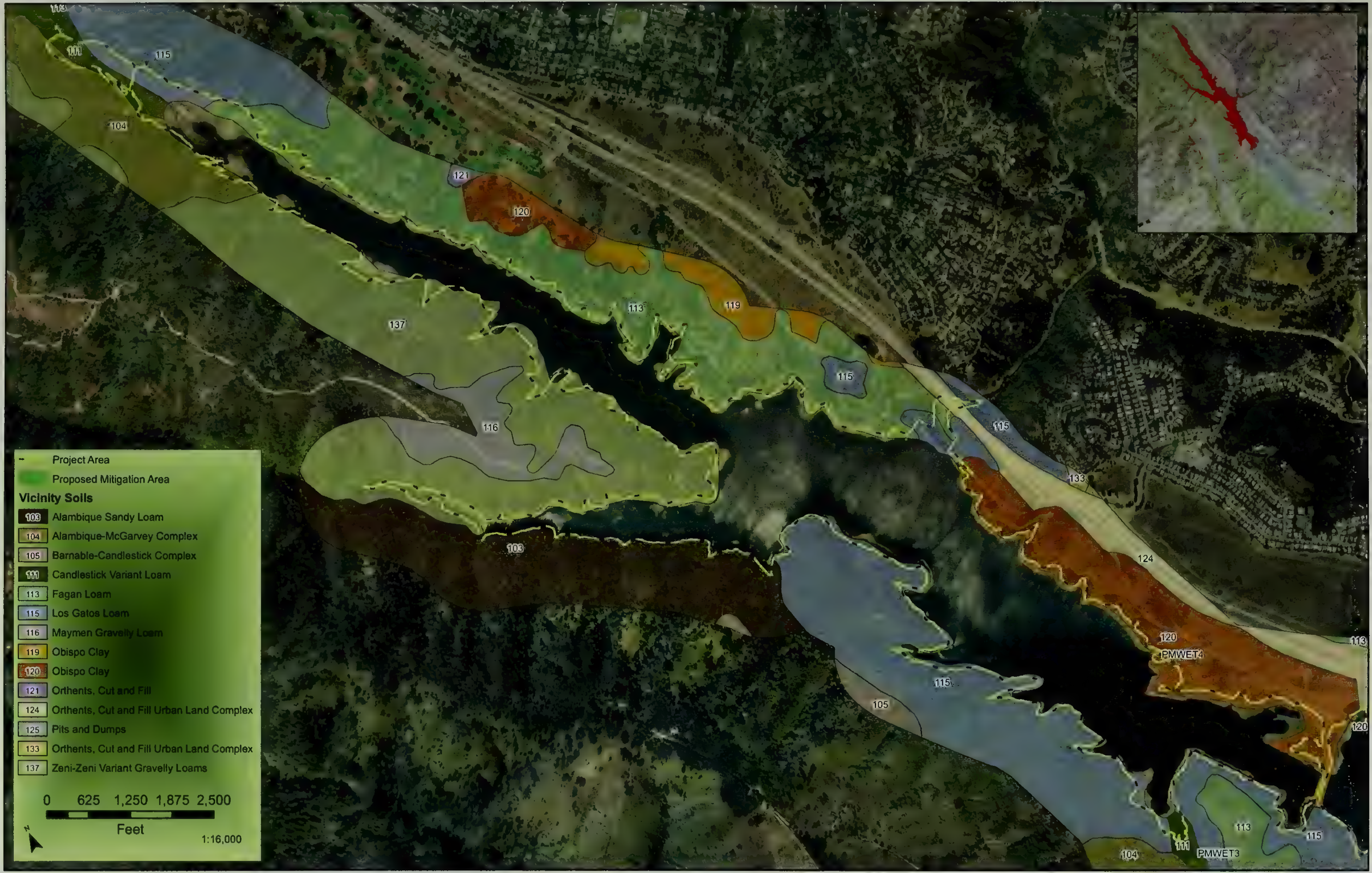
PHOTO 26: Vernal wetlands intergrading with freshwater marsh and perennial aquatic communities located at the south end of Upper Crystal Springs Reservoir.

PHOTO 27: Wetland soil pit showing a low chroma matrix of 5 Y 4/1. Dominant vegetation is knotgrass (*Paspalum distichum* [OBL]).

PHOTO 28: Typical wetland soil with mottles of 5 YR 4/6.

Appendix F

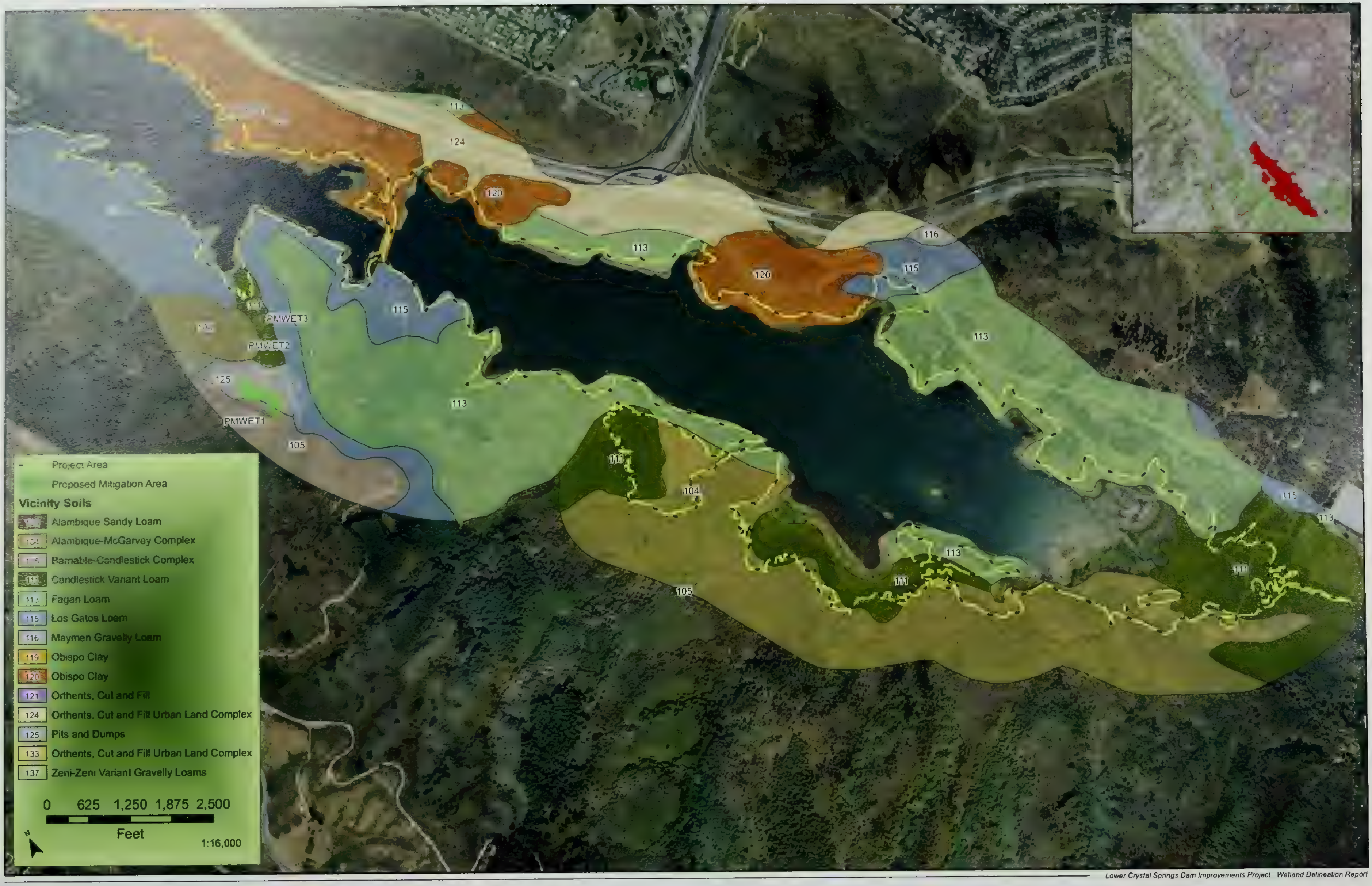
Soil Survey Maps of the Project Vicinity



Lower Crystal Springs Dam Improvements Project Wetland Delineation Report

Appendix F : Figure 1 of 2

Soil Survey Maps of the Project Vicinity



Lower Crystal Springs Dam Improvements Project Wetland Delineation Report

Appendix F : Figure 2 of 2

Soil Survey Maps of the Project Vicinity

APPENDIX I

Biological Resources Technical Report

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Lower Crystal Springs Dam Improvement Project

San Mateo County, California

BIOLOGICAL RESOURCES TECHNICAL REPORT

August 2009

Prepared by
ENTRIX/MSE

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QUALITY ASSURANCE/QUALITY CONTROL

Biological Resources Technical Report

For The Proposed

Lower Crystal Springs Dam Improvements Project

Principal Authors:	Gretchen Lebednik, Karen Swaim, Keven Ann Colgate, Robert Schell
Technical Review:	Brenda Peters
Technical Editor:	Don Craig

August, 2009

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1.0 Summary of Findings

Crystal Springs Reservoir System has thirteen vegetative communities that provide habitat for a variety of wildlife species. Multiple surveys for the presence of flora, habitat and fauna were conducted to closer examine the likelihood of presence of sensitive botanical and wildlife species contained in the Crystal Springs Reservoir System. The botanical surveys were conducted during the spring and summer blooming periods for coastal California during 2006 (April 25-28, May 22-26, July 24-August 5). Reconnaissance-level habitat evaluation and wildlife surveys were also conducted in 2006 (May 4-5 and June 26). The methods for these surveys are described in Section 3.0.

Sections 4 and 5 briefly describe the flora and fauna with the potential to be observed in the Lower Crystal Springs Dam Improvements Project Area (Project Area) based on various natural resource agencies and the California Natural Diversity Database. The probability of occurrence is also stated if the species was not observed during the 2006 surveys. Section 4.1 describes the thirteen vegetation communities. Section 5.1 provides the analysis of distribution, known occurrences, and habitat requirements of 26 special status plant species that may occur in the Project Area and their listing status. A total of eight special- status plant species were observed during the 2006 surveys of the Project Area. All surveyed populations are associated with woodland, scrub or grassland communities adjacent to the ordinary high water line of Upper and Lower Crystal Springs Reservoirs. The plant species observed were fountain thistle, Marin western flax, Franciscan onion, San Francisco collinsia, western leatherwood, California bottle brush grass, Crystal Springs lessingia, and arcuate bush mallow.

Special status terrestrial wildlife species observed in the Project Area include six out of a total of 39 that have the potential to occur in the Project Area. Four of the observed species are birds, one reptile and one mammal. All 39 species are discussed in Section 5.2. The species observed in 2006 include: San Francisco garter snake, tricolored blackbirds, Vaux's swifts, saltmarsh common yellowthroat, double-crested cormorants, and San Francisco dusky-footed woodrats. In addition, host plants for the bay checkered spotted butterfly and the Mission blue butterfly were present at the time of the 2006 surveys although the butterflies were not directly observed. These two species of butterflies are included the total count of special-status terrestrial species with the probability to occur in the Project Area.

Six special-status aquatic species are potentially present in the Project Area. Two of the sensitive aquatic species were observed during the 2006 surveys the red-legged frogs and the western pond turtle.

In summary, 71 special-status species have some probability of existing or utilizing the Project Area. In 2006, sixteen of the 71 species were confirmed within the Project Area. Focused surveys are continuing in 2007 for the California red-legged frogs and San Francisco garter snakes and tables provided in the species discussion to summarize the current findings.

1.1 Project History

Operated by the San Francisco Public Utilities Commission (SFPUC) for water supply storage, Lower Crystal Springs Dam is located on San Mateo Creek approximately three miles west of the City of San Mateo (See Figure 1, Project Vicinity and Figure 2, Project Area Map). One of the termini of the Hetch Hetchy water system, Lower Crystal Springs Dam provides storage for local runoff in the largest storage facilities on the San Francisco Peninsula: Upper and Lower Crystal Springs Reservoirs.

The dam was classified as a high hazard by the California Division of Safety of Dams (DSOD) in 1980 because it could not safely pass the Probable Maximum Flood (PMF). The Lower Crystal Springs Dam Improvements Project (Project) was identified by the SFPUC as a high priority project for implementation to maintain reliable water supply for the San Francisco and the Peninsula. Currently, the Crystal Springs Reservoir System, which includes both Upper and Lower Crystal Springs Reservoirs, is operated at reduced levels to comply with DSOD restrictions.

1.2 Project Description

The proposed Lower Crystal Springs Dam Improvements Project includes raising the parapet wall, widening the spillway and modifying the crest, expanding the stilling basin and installing erosion control measures (e.g., riprap), and improving drainage at the top of the Dam. These improvements to the Dam and associated facilities would allow the SFPUC to restore operations to historic permissible maximums in the Crystal Springs Reservoir System. A new integral ogee-shaped spillway crest would be installed to replace the existing and antiquated stop log system. The elevation of the spillway would be 291.8 feet. The spillway would be widened from the existing 88 feet to about 208 feet. The parapet wall is a concrete solid wall built along the top of the dam on the upstream dam crest to prevent overtopping caused by wave runup. The parapet wall would be lowered just less than 1 foot in these new spillway sections. Partial demolition and reconstruction of the parapet walls north and south of the modified spillway would increase the height by as much as 9 feet to approximately elevation 301 (NGVD 29). Construction of a new stilling basin at the base of the dam would include a new 5-foot-thick roller-compacted concrete floor and new sidewalls. The new stilling basin would be approximately 145 feet by 175 feet. The new basin side walls would be 3 feet thick, about 50 feet long and 18.5 feet high. To prevent ponding on the top of the Dam, the Proposed Project includes drainage improvements. Drainage improvements could be accomplished by one of the following three methods: (1) cutting small notches on the downstream face, (2) coring a few holes in the side of the downstream face, or (3) filling the ponded areas with concrete.

Under the Proposed Project, erosion control measures (e.g., riprap) would be placed within and along the banks of San Mateo Creek, just downstream of the expanded stilling basin, to prevent erosion. The material would protect against the action of water and/or waves that could otherwise lead to erosion or scour of the creek bank. The proposed erosion control material would be approximately 5 feet deep, 50 feet long by 150 feet wide (37,500 cubic feet).

The Proposed Project includes a new instrumentation building (with a parking lot, driveway and swales) located on the west side of Skyline Boulevard, adjacent to Vista Point. The proposed instrumentation building would be approximately 21.3 feet long by 12 feet wide, for a total of 256 square feet. The proposed height of the building would be approximately 12 feet. With its adjoining structures – parking (808 square feet), and the driveway and swales (173 square feet) – the instrumentation building would have a total footprint area of 1,237 square feet. The proposed access path from the instrumentation building to the Dam would be located along the east side of the proposed building. This pathway would be approximately 5 feet wide and 136 feet long, for a total footprint area of 680 square feet. From the proposed instrumentation building, the access pathway would run southwest to the east side of the Dam...

Spoils from excavation of the stilling basin, erosion control area, instrumentation building, driveway, and access path would be stored onsite temporarily and then hauled offsite to an appropriate landfill. It is estimated that the Project Area could accommodate up to 7,500 cy of spoil material. The remaining excavated spoil material would require offsite disposal.

The proposed Project would allow the dam to operate within historical minimum and maximum reservoir levels. The maximum design operating level would range from the current limit at elevation 283.8 to the proposed future elevated limit at elevation 291.8, and would occur on or about May 1. The anticipated operating reservoir levels following implementation of the proposed Project would range from a low elevation of 273.3 (NGVD 29) to a high elevation of 291.8 (NGVD 29).

The increased inundation level could require the retrofit or modification of some roads and facilities located within the reservoir footprint at elevations near or below the 291.8 foot level of the proposed spillway.

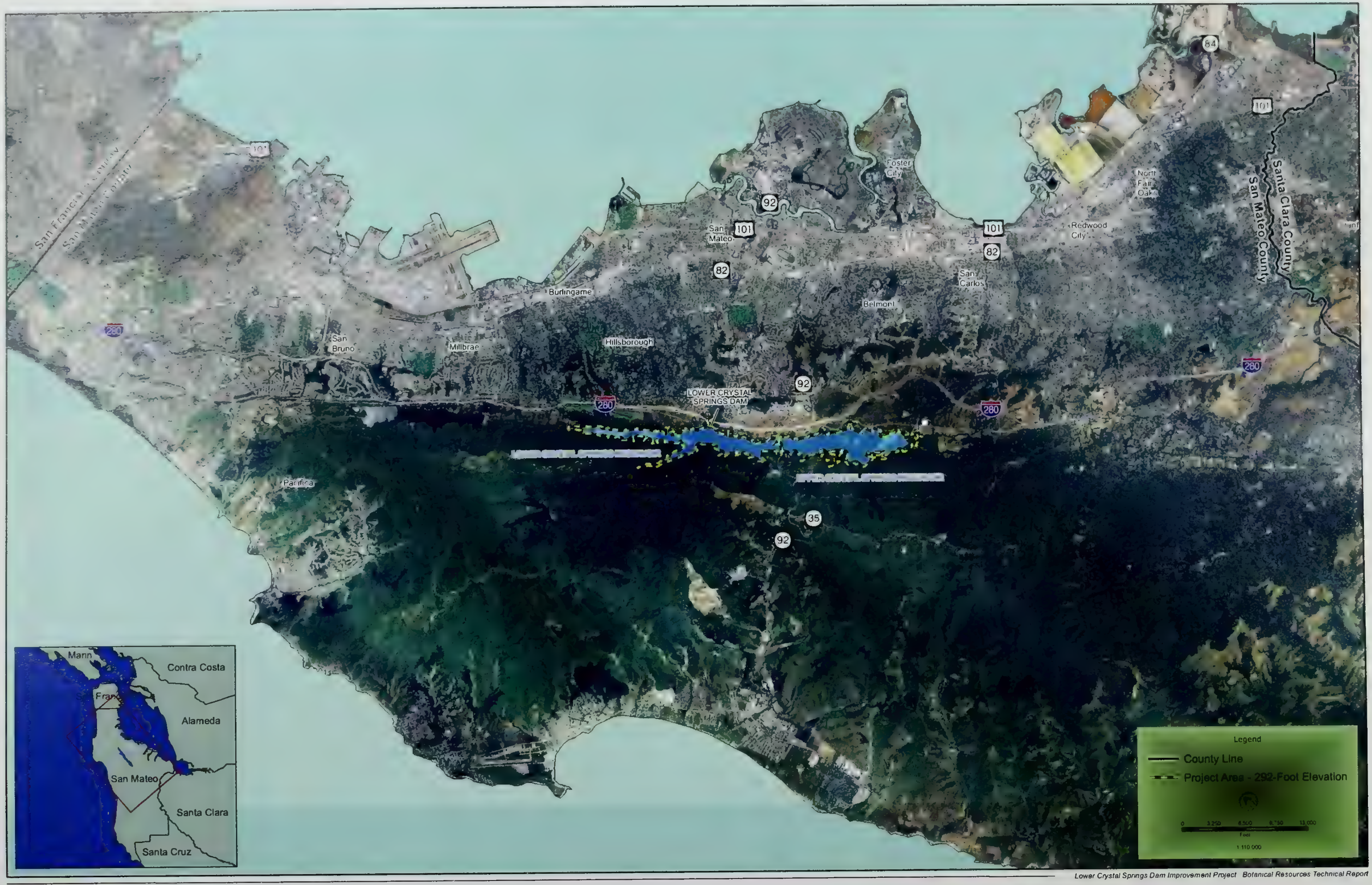

Figure 1

Project Vicinity Map

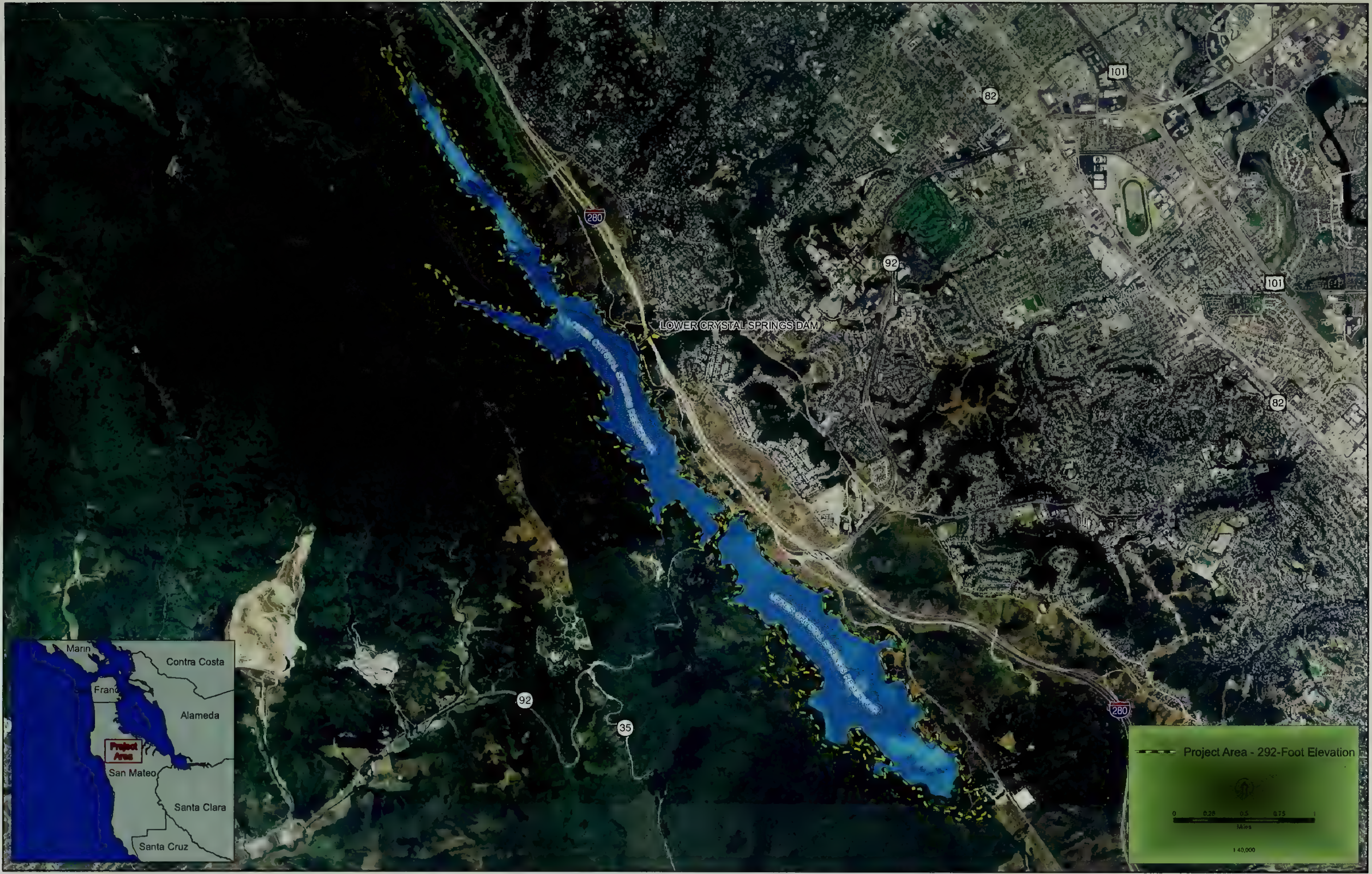

Figure 2

Project Area Map

2.0 STUDY METHODS

The methods used to prepare this Biological Resources Technical Report are described below. The results of the study are provided in Section 3.

2.1 Vegetation Community Mapping

ENTRIX biologists performed initial vegetation community mapping for the vegetation study area in April and May 2006. For purposes of this exercise, the study area included the lands within the Project Area (and lands immediately adjacent to the Project Area to create a contiguous buffer around the Project Area. The Project Area was defined as the shoreline of both Upper and Lower Crystal Springs Reservoirs within the 291.8-foot contour line areas at the base of the Lower Crystal Springs Dam that are within the construction limits of the Project. Preliminary vegetation community maps were produced in Geographic Information System (GIS), based on interpretation of recent aerial images. This mapping exercise was followed by a field survey to verify the accuracy of the maps and identify any additional vegetation communities or habitats that should be included.

The field survey consisted of viewing the entire vegetation study area on foot or via watercraft, or with binoculars from an accessible viewing point. Generally, only vegetation communities larger than one acre in size were delineated. The field data were used to revise the preliminary vegetation maps.

2.2 Special-Status Species Literature Search

A list of special-status plant species with potential to occur in the Project Area was compiled through reviews of a number of sources, including available literature, museum specimen (MVZ, CAS) databases, and the Internet. Sources included a review of California Department of Fish and Game's (CDFG) California Natural Diversity Database (CNDDB) (CDFG 2006a), as well as the US Fish and Wildlife Service (USFWS) Sacramento District website (USFWS 2006). Both the CNDDB and the USFWS website were queried by 7.5-minute quadrangle. The list of Project quadrangles (quads) included Montara Mountain, San Mateo, and Woodside. Additional species were included in the analysis, based on known distribution, habitat requirements, and/or incidental sightings. Other literature sources – including Zeiner et al. (1988, 1990a, 1990b) and the California Wildlife Habitat Relationship (CWHR) database (CDFG 2000) – were referenced as appropriate.

Special-status species include plant species that have been afforded special-status designations by federal and state resource agencies and organizations. These include species that are federally listed as endangered (FE) or threatened (FT), and candidate species for listing (FC) under the Federal Endangered Species Act (ESA). In addition, the list includes species protected by the State of California as endangered (CE), threatened (CT), or rare (CR), as well as state candidate species for listing (CC). And finally, the list includes species that are listed in the California Native Plant Society (CNPS) Inventory of Rare and Endangered Plants of California. The latter list includes species on CNPS List 1A (presumed extinct in California), List 1B (rare, threatened or endangered in California and elsewhere), and List 2 (rare in California but more common elsewhere). Not included in the potential species list (but considered) were both List 3 plants (about which we need more information - a review list) and List 4 plants (those of limited distribution - a watch list). In 2006, ENTRIX also surveyed for host plants that are utilized by special-status invertebrate species potentially present in the Project Area.

A list of special-status plant species potentially occurring in the Project Area was developed through the botanical literature review described above. Appendix A provides a tabulation of sensitive plant species having potential to occur within the immediate Project Area, presented in Appendix A, Table A-1. The table also includes scientific and common name, listing status, growth form, general habitat conditions, and potential for occurrence in the Project Area.

2.3 Species Research and Survey Preparation

ENTRIX surveyors visited the University of California at Berkeley's Jepson Herbarium to view specimen samples. Photographs of target species were recorded and studied. In addition, the surveyors searched literature and web resources for species information. Materials including species accounts, habitat descriptions, drawings and/or photos were compiled and presented to each surveyor prior to the start of field surveys.

2.4 Protocol Plant Surveys

2.4.1 Survey Area

The survey area was the Project Area, defined as the shoreline of both Upper and Lower Crystal Springs Reservoirs within the 291.8-foot contour line areas at the base of the Lower Crystal Springs Dam that are within the construction limits of the Project.

2.4.2 Survey Schedule

An evaluation of known blooming periods determined the timing of the field surveys. Appendix A provides a list of target species and their known blooming periods. The information in this table was used to identify appropriate survey periods.

Surveys were conducted during the spring and summer blooming periods for coastal California. Three surveys of the entire Project Area were conducted during the periods of April 25 to 28, May 22 to 26, and July 24 to August 5.

2.4.3 Survey Method

ENTRIX conducted surveys in accordance with the *Guidelines for Assessing Effects of Proposed Projects on Rare, Threatened, and Endangered Plants and Natural Communities* (CDFG 2000), as well as *General Rare Plant Survey Guidelines* (USFWS 2002a). Depending on the survey area and terrain, surveyors utilized a variety of survey methods that allowed visual surveillance of the entire area. These included walking in a zigzag or linear pattern, and/or random meandering. Areas inaccessible due to high water were surveyed by boat. Areas inaccessible due to safety issues (i. e., steep or rocky slopes) were surveyed from a safe vantage point.

Surveys were floristic in nature, and surveyors recorded all native and naturalized vascular plant species observed during surveys. Floristic survey methods involve identifying all species to the level necessary to determine if they are special-status plants, or whether they are a plant species with unusual or significant range extensions. Primary taxonomic references include *The Jepson Manual* (Hickman 1993), *A California Flora and Supplement* (Munz and Keck 1968), *Trees and Shrubs of California* (Stuart and Sawyer 2001), and *Manual of the Grasses of the United States* (Hitchcock and Chase 1971). Nomenclature was based on *The Jepson Manual* (Hickman 1993) and other sources where indicated. Horticultural species were only recorded when occurring naturalized in a native vegetation community.

For each special-status plant species or population observed, surveyors recorded the approximate location with a GPS unit, marking it on aerial survey maps, and incorporating it into a GIS database. Surveyors' records also include an estimate of the number of individuals present, their phenology, and the associated vegetation. Additionally, a CNDDB form was completed for each special-status plant population identified (CNPS List 4 species were not reported).

2.4.4 Survey Personnel

Qualified teams of two ENTRIX, Inc. Environmental Scientists conducted all surveys. At all times during each survey, the survey team included at least one qualified botanist. ENTRIX, Inc. survey personnel included:

- Keven Ann Colgate – Senior Staff Environmental Scientist, 6 years of botanical experience.
- Amanda Burgess – Staff Environmental Scientist, 2 years of experience in terrestrial biology and botany.
- Gretchen Lebednik – Project Scientist, 22 years of botanical experience.
- Sara Ebrahim – Senior Staff Environmental Scientist, 6 years of experience in terrestrial biology and botany.

2.5 Reconnaissance-Level Habitat Evaluation

Reconnaissance-level habitat evaluation and wildlife surveys were conducted by ENTRIX biologists Rob Schell, Daniel Chase, and Chris Hogle on May 4, May 5, and June 26, 2006. During these surveys, at least two different sites were visited, representing each habitat type within the Project Area. Detailed notes on each habitat type were taken, including vegetation type and structural components (i.e., canopy cover and canopy height). Photographs of each site were taken, and wildlife species encountered were recorded for each site. Data from each site were compiled to create a detailed description of each habitat type representative of that habitat within the Project Area. This compilation was then compared to the habitat requirements for each of the special-status species listed in Appendix A.

2.6 Focused Wildlife Surveys

Focused surveys for the California red-legged frogs and the San Francisco garter snake are currently being conducted in the Project Area. These surveys are under the direction of Karen Swaim. Data from these surveys are provided in Section 4.2.

2.6.1 Visual Surveys

California Red-legged Frog

Visual surveys for CRLF (all life stages) were conducted on separate days between February 2, 2006 and August 25, 2006. The visual surveys were conducted by individuals permitted to handle SFGS and CRLF under Federal Recovery Permit #815537, held by Swaim Biological Inc. When CRLF were found, GPS coordinates and habitat type were recorded, and when possible, photos were taken.

Visits to the top of the dam pool (TDP) and the spillway area below the LCS dam were conducted on several occasions during the survey period. This habitat and the breeding activity for CRLF at this site were described in detail in McGinnis (1998) and McGinnis (2003). The aquatic habitat is a basin formed by the cement walls on the top of the dam. The pool is located at the very south end of the dam and is visible from the road above.

From February 2 to until mid April, wildlife biologists conducted searches for CRLF egg masses in all accessible LCSR and UCSR marsh habitats and the CALTRANS sediment basins. The purpose of these surveys was to identify CRLF egg masses and determine the location of breeding habitat for CRLF at any of the marsh locations.

Surveys were conducted using four to six biologists, usually split into pairs. Biologists would walk a pre-determined portion of the perimeter of UCSR or LCSR, as well as the sediment basins, Tracy Lake (TL), and TDP looking for CRLF egg masses attached to submerged vegetation or deposited on the reservoir bottom near the shore. Binoculars were used to aid in searching and identification. No walking was done in the water to avoid disturbance of submerged egg masses. Biologists also surveyed using kayaks, which allowed access to deeper water, and areas that were difficult to access by foot.

From mid April to August 25, 2006, the focus of visual surveys was to locate CRLF larvae and recent metamorphs, as well as SFGS. Larvae surveys were conducted using dip nets and a minnow seine with a mesh size of 1/8 inch. Marsh areas around the perimeter of UCSR and LCSR were identified and systematically surveyed by four biologists at a time. Two biologists would use dip nets and two other biologists would manipulate the seine in an effort to capture and identify CRLF larvae. Surveys for CRLF metamorphs were conducted by visually scanning the waters edge using binoculars and by encountering the small frogs while walking. Biologists also recorded any other animals seen incidentally, with special attention paid to potential predators of CRLF (e.g., crayfish, bullfrogs, fish).

During the winter breeding season of 2006-2007 biologists conducted surveys on 40 separate days between 4 December 2006 and 23 March 2007. Additionally, night surveys were conducted. Night surveys are a more productive technique for locating adult frogs, but reduce chances of detecting egg masses.

CRLF Egg Mass Monitoring

SBI biologists began looking for CRLF egg masses in December of 2007 and continued regular visits through early April, 2007. Egg masses were located during daytime searches both from land and kayaks. This more intensive egg mass survey was designed to better quantify preferred CRLF egg deposition locations, and measure the impact of fluctuating water levels on egg survival and growth. Habitat characteristics including water depth, vegetation type, water temperature, and substrate were recorded. Egg masses were checked frequently to assess development and hatching success or failure.

San Francisco Garter Snake

SFGS were searched for visually during day surveys for CRLF as described above. Surveys were conducted or supervised by individuals permitted to handle SFGS under Federal Recovery Permit #815537, held by Swaim Biological, Inc. Search effort was concentrated on the edge of water bodies and shallow marshy areas where SFGS are most likely to be seen basking or foraging for tadpoles and fish.

A more intensive trapping survey for SFGS was conducted in Stilling Basin, the drainage below the LCSR Dam.

Western Pond Turtle

WPT were encountered while basking on the shore. Because turtles generally dove below water, binoculars were used to distinguish WPT from other species of turtle.

2.6.2 Trapping Surveys

San Francisco Garter Snake

A more intensive trapping survey was conducted in Stilling Basin, the drainage below the LCSR Dam. 18 traplines were active for 37 days, from 2 April 2007 to 9 May 2007. Traplines consisted of a drift fence, approximately 24 feet long, with two single-funnel traps positioned at each end. Drift fences are constructed from three pieces of 1/8th-inch-thick, flexible hardboard. Each drift fence is 14 inches high with approximately two inches of fence buried.

A single-funnel trap is composed of a rectangular wooden frame covered by panels of 1/8-inch wire mesh to allow for air circulation. A wire mesh funnel, narrowing to roughly 1.5 inches at the terminus, is secured into one end of each trap. To keep captured animals from exiting, circular mylar flaps are affixed to the inner terminus of each funnel. Each trap is fitted with a recessed "dish" to allow for the inclusion of an anti-desiccant (SoilMoist™) to protect captured amphibians from dehydration. One or two pieces of plywood or oriented particle board measuring approximately 16 inches x 20 inches are placed on top of each trap to provide additional shade.

3.0 RESULTS: ENVIRONMENTAL SETTING

3.1 Vegetation Communities

Upland communities within the Project Area include non-native grassland, northern (Franciscan) coastal sage scrub, northern mixed chaparral, coast live oak forest, non-native woodland, and mixed evergreen forest.

Riparian, aquatic, and seasonally wet areas include Central Coast riparian scrub, as well as coastal and valley freshwater marsh/vernal marsh. Lacustrine areas are also included in this category.

Areas influenced by humans are classified as developed land, and areas devoid of vegetation are classified as lake shoreline fluctuation zone (which include both ruderal and barren areas).

General community descriptions are derived from Holland (1986), and other sources where indicated. A brief description of these communities and their location within the Project Area is provided below. Appendix E provides maps showing the distribution and extent of these communities in the vicinity of the Project.

Table 3-1: Vegetation Communities and Other Habitats within the Project Area

Habitat Type	Project Variant Inundation Acres	Construction Acres
Coast Live Oak Forest	48.0	0.1
Mixed Evergreen Forest	18.5	3
Coastal Sage Scrub	26.4	--
Northern Mixed Chaparral	0.3	--
Non-Native Grassland	30.1	0.04
Non-Native Woodland	5.0	--
Herbaceous Wetland	227.1	0.03
Scirpus-Typha	21.5	--
Riparian	81.5	1.01
Total	**458.4***	**5**

* Total excludes Lacustrine/Unvegetated, which comprised 30.2 acres in the 488.6 acre area analyzed in the EIR. Also excluded from analysis in the EIR are: 1) areas mapped above 292 ft elevation; 2) areas mapped below 263 ft elevation; 3) areas mapped as developed; 4) areas not attributed to a cover type; and 5) areas mapped as "open water" between 263 ft and 276 ft elevation.

3.1.1 Grassland Communities

Non-native Grassland – NNGL

The non-native grassland community includes a heterogeneous mix of non-native grasses, annual forbs, and wildflowers. This community is characterized by a dense to sparse cover of annual grasses with flowering culms approximately 1 to 2 feet high. It is often associated with numerous species of showy-flowered, native annual forbs (wildflowers), especially in years of favorable rainfall. Germination occurs with the onset of the late fall rains; growth, flowering, and seed-set occur from winter through spring. With a few exceptions, the plants are dead through the summer-fall dry season, persisting as seeds. This community type is distributed throughout the valleys and foothills of most of California (except for the northern coastal and desert regions), usually below 3,000 feet (Holland 1986).

Dominant plant species found in non-native grasslands within the Project Area include introduced annual grasses such as wild oat (*Avena fatua*), ripgut brome (*Bromus diandrus*), barley (*Hordeum* spp.), and fescue (*Vulpia* spp.). Herbaceous forbs and wildflowers include fiddleneck (*Amsinckia* spp.), shortpod mustard (*Hirschfeldia incana*), filaree (*Erodium* spp.), and yellow star thistle (*Centaurea solstitialis*). Non-native grassland is found throughout the Project Area. Intermittent patches occur along the western shore of both Upper and Lower Crystal Springs Reservoirs, generally associated with inlets having a gently sloping shoreline. Extensive grassland communities are present along the eastern shore of both reservoirs.

Characteristic wildlife species generally found in annual grasslands include western fence lizards (*Sceloporus occidentalis*), western rattlesnake (*Crotalus viridis*), western harvest mouse (*Reithrodontomys megalotis*), coyote (*Canis latrans*), and western meadowlark (*Sturnella neglecta*) (Mayer and Laudenslayer 1988). Annual grasslands also serve as foraging habitat for many predatory species such as American kestrels (*Falco sparverius*) and white-tailed kites (*Elanus leucurus*). Annual grasslands within the Project Area provide nesting habitat for western pond turtles (*Clemmys marmorata*).

3.1.2 Chaparral and Scrub Communities

Scrub and chaparral communities are found on both the eastern and western sides of the watershed, particularly in association with south-facing slopes. In general, scrub communities are dominated by low shrub species present in various densities, with or without a grassy-herbaceous understory. Chaparral cover types are defined by a dense colony of woody, broadleaved sclerophyllous shrubs, generally reaching several meters in height. These communities are well adapted to disturbance by fire, and generally occupy dry, rocky slopes with little soil development. Scrub and chaparral communities within the Project Area include Northern (Franciscan) coastal sage scrub and northern mixed chaparral.

Northern Coastal Sage Scrub – NCSS

Northern (Franciscan) coastal sage scrub is described by Holland (1986) as sage scrub composed of low shrubs approximately 1 to 6 feet tall, forming a dense patch with scattered grassy openings. Growth occurs in late spring and early summer. Sage scrub is generally found on exposed, often south-facing, slopes with shallow, rocky soils.

Dominant species include California sagebrush (*Artemisia californica*), golden yarrow (*Eriophyllum confertiflorum*), coyote brush (*Baccharis pilularis*), California coffeeberry (*Rhamnus californica*), elderberry (*Sambucus mexicana*), sticky monkey flower (*Mimulus*

aurantiacus), poison oak (*Toxicodendron diversilobum*) and various sage (*Salvia* spp.) species (Holland 1986). Some areas mapped as coastal scrub are primarily dominated by coyote brush and/or poison oak. In the Project Area, coastal scrub is generally found along the eastern shore of both reservoirs.

Coastal scrub appears to support numbers of vertebrate species roughly equivalent to those in surrounding habitats (Stebbins 1978). Wildlife typically found in coastal scrub habitats comprises western scrub jay (*Aphelocoma californica*), lesser goldfinch (*Carduelis psaltria*), Bewick's wren (*Thryomanes bewickii*), blacktailed jackrabbits (*Lepus californicus*), and California kingsnake (*Lampropeltis getula*) (Mayer and Laudenslayer 1988).

Northern Mixed Chaparral – NMC

Northern mixed chaparral, classified by Holland (1986) as a subset of upper Sonoran mixed chaparral, is a chaparral community composed of broadleaved sclerophyllous shrubs, 6 to 12 feet tall. These shrubs form dense vegetation stands with no appreciable understory and a considerable accumulation of leaf litter. Dominant species include scrub oak (*Quercus* sp.), chamise (*Adenostoma fasciculatum*), and any one of several types of manzanita (*Arctostaphylos* spp.) and ceanothus or buckbrush (*Ceanothus* sp.). Several areas on the western shore of Lower Crystal Springs Reservoir are dominated exclusively by chamise. Northern mixed chaparral is found along the western shore of Lower Crystal Springs Reservoir.

No wildlife species are restricted to mixed chaparral. Most species are found in other shrub-dominated habitats, such as those mentioned for coastal scrub. Common species include Anna's hummingbird (*Calypte anna*), wrentit (*Chamaea fasciata*), spotted towhee (*Pipilo maculatus*), western fence lizard, brush rabbit (*Sylvilagus bachmani*), and mule deer (Mayer and Laudenslayer 1988).

3.1.3 Woodland Communities

Woodland cover types range from very open savanna with grassland ground layer to dense forested areas with nearly impenetrable shrub understories. Within the Project Area, woodland-dominated vegetation communities dominate on cooler, more mesic, north-facing slopes, as well as in canyons and ravines.

Coast Live Oak Forest – CLOF

Coast live oak forest typically has one dominant tree, the coast live oak (*Quercus agrifolia*): a broad-crowned, sclerophyllous evergreen tree up to 80 feet in height. The shrub layer in this community is poorly developed, but may include toyon (*Heteromeles arbutifolia*), ribes (*Ribes* spp.), and Mexican elderberry (*Sambucus mexicana*). The herb component is generally dominated by brome grasses (i. e., ripgut brome) and several other introduced taxa. This community typically occurs on north-facing slopes and other exposed sites (Holland 1986).

Within the Project Area, communities dominated by coast live oak are extremely variable. The overstory consists of deciduous and evergreen hardwoods, including coast live oak, madrone (*Arbutus menziesii*), and California bay (*Umbellularia californica*). Common understory species include poison oak. In drier sites, the trees are widely spaced, and form an open woodland or savannah. Oak-dominated communities occur throughout the Project Area, but are most common on the western shore of Upper Crystal Springs Reservoir and the southwestern shore of Lower Crystal Springs Reservoir.

Coastal oak woodlands provide habitat for a variety of wildlife species. At least 60 species of mammals are reported to use oaks in some way (Barrett 1980). As many as 110 species of birds have been observed during the breeding season in California habitats where oaks form a significant part of the canopy or sub-canopy (Verner 1980). Typical species occurring in coastal oak woodlands include California quail (*Callipepla californica*), bushtit (*Psaltriparus minimus*), Nuttall's woodpecker (*Picoides nuttallii*), western fence lizard, and mule deer (*Odocoileus hemionus*) (Mayer and Laudenslayer 1988).

Non-Native Woodland – NNW

This woodland community is represented by introduced trees including eucalyptus (*Eucalyptus* sp.), acacia (*Acacia* sp.), Monterey pine (*Pinus radiata*), and Monterey cypress (*Cupressus macrocarpa*). The latter two species are native, but are not native to the inland Bay area, and therefore are not protected in this area. There are several locations in the Project Area that have artificial plantings of each of these species. Monterey pine is most common on the eastern shore of Upper Crystal Springs Reservoir, while acacia is common on the eastern shore of Lower Crystal Springs Reservoir. Monterey cypress and eucalyptus are found intermittently, but are most common on the western shore of both reservoirs.

Mixed Evergreen Forest – MEF

Mixed evergreen forest is dominated by broadleaved trees forming a closed forest. These trees are usually 30 to 90 feet tall, but often have taller conifers interspersed. Site conditions include moist, well-drained coarse soils, usually on slopes. Within the Project Area, this community is generally composed of a pronounced hardwood tree layer, with a poorly developed shrub stratum, and a sparse herbaceous layer. Common species include Douglas fir (*Pseudotsuga menziesii*), madrone (*Arbutus menziesii*), coast live oak (*Quercus agrifolia*), and California bay (*Umbellularia californica*). Impenetrable poison oak thickets dominate the understory shrub layer. These stands are found primarily on steep northern and eastern exposures. Canopy cover is dense (75 to 80 percent), and canopy height varies from 50 to 100 feet high.

In the Project Area, mixed evergreen forest is found primarily along the western shore of Lower Crystal Springs Reservoir.

Bird and animal species characteristic of the montane hardwood habitat include the acorn woodpecker (*Melanerpes formicivorus*), band-tailed pigeon (*Columba fasciata*), California ground squirrel (*Spermophilus beecheyi*), dusky-footed woodrat (*Neotoma fuscipes*), ensatina (*Ensatina eschscholtzii*), slender salamanders (*Batrachoseps* spp.), and sharp-tailed snakes (*Diadophis punctatus*) (Mayer and Laudenslayer 1988).

3.1.4 Riparian and Wetland Plant Communities

Riparian – RIP

Riparian areas in the Project Area are similar to the Central Coast riparian scrub described by Holland (1986). This riparian scrub is a scrubby streamside thicket, varying from open to impenetrable, dominated by various willow species (*Salix* spp.) (Holland 1986). Central Coast riparian scrub is a dense riparian forest associated with river corridors, seeps, and other wetlands. Canopy height ranges from 15 to 65 feet tall. Within the Project Area, most of the riparian vegetation is composed of dense stands of willow monotypes including sandbar willow (*Salix exigua*) and arroyo willow (*Salix lasiolepis*). On the reservoir shorelines (and along perennial and intermittent drainages feeding into the reservoirs), the species include shining willow (*Salix lucida*), big leaf maple (*Acer macrophyllum*), and Fremont cottonwood (*Populus fremontii*). Below Lower Crystal Springs Dam, willows dominate the riparian corridor, interspersed with some larger cottonwoods.

Riparian forests and scrubs are extremely rich in their associated fauna. Many species of birds such as yellow warblers (*Dendroica petechia*) are riparian obligate breeders. Black phoebes (*Sayornis nigricans*) and red-shouldered hawks (*Buteo lineatus*) are also associated with riparian habitats. Vagrant shrews (*Sorex vagrans*) are common mammalian species occurring within the riparian woodlands of the San Francisco peninsula. Common herpetological species associated with riparian habitats are western pond turtles, garter snakes (*Thamnophis* spp.), Pacific chorus frogs (*Pseudacris regilla*), and western toads (*Bufo boreas*).

Freshwater Marsh – FWM

Freshwater marsh communities within the Project Area comprise characteristic vernal marsh, as well as coastal and valley freshwater marsh, as described by Holland (1986). The coastal and valley freshwater marsh community is dominated by perennial, emergent monocots such as cattail (*Typha* spp.) and bulrushes (*Scirpus* spp.). Vegetation is typically 12 to 15 feet tall, with a closed canopy. This community occurs in permanently flooded, fresh water sites that are lacking a significant current (Holland 1986). Vernal marsh communities are dominated by low growing annual herbs, often flowering behind the retreating waters edge as the marsh dries. Sites are marshy, with standing water following winter rains, and are generally dry by summer (Holland 1986). Seasonal and permanent freshwater marsh communities are found in association with the shoreline of both reservoirs, especially in calm inlets and coves with gently sloping shorelines. Extensive areas of freshwater marsh are found at the northern end of Lower Crystal Springs Reservoir and the southern end of Upper Crystal Springs Reservoir.

This habitat provides a high quality seasonal resource for red-winged blackbirds (*Agelaius phoeniceus*), egrets and herons (family Ardeidae), garter snakes (*Thamnophis* spp.), ranid frogs (family Ranidae) and waterfowl – such as American coots (*Fulica americana)* and mallard ducks (*Anas platyrhynchos*) – and many others (Mayer and Laudenslayer 1988).

Lacustrine – LAC

Upper and Lower Crystal Spring Reservoirs provide extensive lacustrine habitat in the Project Area. Lacustrine habitats are defined as inland depressions or dammed riverine channels containing standing water (Cowardin et al. 1979). In general, lacustrine areas are too deep to support vegetation. However, shallow areas and along the reservoir edge are commonly vegetated with variable-leaf pondweed (*Potamogeton gramineus*) and water smartweed (*Polygonum amphibium*). Parrot's feather (*Myriophyllum aquaticum*) is also found in a few locations.

Resources for wildlife within lacustrine habitats include numerous forms of aquatic insects that provide forage for many species of insectivorous birds and bats. Within lacustrine habitats, amphibian species deposit their eggs and larvae develop. Western pond turtles are often associated with reservoirs as well.

The reservoirs provide coldwater habitat for both native and non-native fish species (ESA 1994). Native species in these reservoirs include Sacramento sucker (*Catostomus occidentalis*), threespine stickleback (*Gasterosteus aculeatus*) prickly sculpin (*Cottus asper*), and stocked rainbow trout (*Oncorhynchus mykiss*). Non-native fish that have been captured in these reservoirs (ESA 1994) include large-mouth bass (*Micropterus salmoides*) and bluegill (*Lepomis macrochirus*).

Riverine

Limited stream habitat is present in the Project Area. Short sections of small tributary streams around the perimeter of the reservoirs lie within the Project Area, although most of these are not perennial. Flow in San Mateo Creek immediately downstream of LCSD carries water from seepage from around the dam and from local drainage during runoff events. There are no releases made from the reservoir to sustain flows downstream. However, the emergency release valve and a second set of valves downstream are leaking and provide some flow to the creek. Upstream and downstream from the Project Area, San Mateo Creek provides habitat for both native and non-native fish species, including the Central California coastal steelhead ESU, threespine stickleback, and mosquitofish (*Gambusia affinis*) (ESA 1994).

3.1.5 Disturbed Areas

Lake Shoreline Fluctuation Zone – FZ

The lake shoreline fluctuation zone is defined by the minimum and maximum pool elevations for the reservoir under current operating conditions. Ruderal and barren areas within this zone are generally devoid of vegetation, or sustain less than 10 percent vegetative cover. Bare areas within the ordinary high water occur throughout the reservoir, in areas that do not readily support vegetation because they are too steep, rocky, or sandy. Occasionally, bare patches are associated with sediment deposits from channels draining in to the reservoirs. This area was mapped in concert with the reservoirs' lacustrine zone.

Developed Land – DL

Developed land is intensively used, with much of the land paved or covered by structures. The urban category includes residential, commercial, and industrial development. Vegetation in urban areas generally consists of non-native landscape species (lawns, flowerbeds, shrubs, or ornamental trees), or cleared areas that are generally devoid of vegetation. Development within the Project Area includes recreational pathways, several access roads, land adjacent to two residences, and the immediate vicinity of Lower Crystal Springs Dam.

Several anthropogenic bat houses are present in the vicinity of the LCSD, but no evidence of use (guano, urine wash, or bats visibly in present in the boxes) was observed during surveys in 2006. Also present in the Project Area below the LCSD were small aquatic pools occupied by stranded trout and Pacific chorus frog larvae. The structure of the dam provides small basins along the top of the dam in which CRLF eggs have been observed.

4.0 RESULTS: SPECIAL-STATUS SPECIES

Special-status species potentially present in the Project Area include plants, terrestrial wildlife, and aquatic wildlife.

4.1 Special-status Plant Species

Based on data in the CNDDB and other literature sources, there are 33 special-status plant species initially identified as potentially occurring in the Project vicinity (CDFG 2006a, USFWS 2006). Appendix A provides a tabulation of the scientific and common names of these plants, as well as listing status, growth form, general habitat conditions, and potential to occur in the Project Area. An analysis of distribution, known occurrences, and habitat requirements produced a list of 26 species for which suitable habitat exists within the Project Area. This list includes six species that are federally and state-listed as endangered or threatened, one California Rare species, and 19 other special-status plant species. Table 4-1 presents a summary of these plant species, including scientific and common name and listing status.

Table 4-1: Special-status Plant Species with Potential to Occur in the Project Area

COMMON NAME, SCIENTIFIC NAME	STATUS	COMMON NAME, SCIENTIFIC NAME	STATUS
Acanthomintha duttonii San Mateo thorn-mint	FE, CE, CNPS 1B	*Fritillaria liliacea* fragrant fritillary	CNPS 1B
Allium peninsulare var. *franciscanum* Franciscan onion	CNPS 1B	*Grindelia hirsutula* var. *maritime* San Francisco gumplant	CNPS 1B
Amsinckia lunaris bent-flowered fiddleneck	CNPS 1B	*Hesperolinon congestum* Marin western flax	FT, CT, CNPS 1B
Arctostaphylos andersonii Santa Cruz manzanita	CNPS 1B	*Lessingia arachnoidea* Crystal Springs lessingia	CNPS 1B
Arctostaphylos montaraensis Montara manzanita	CNPS 1B	*Malacothamnus arcuatus (=M. fasciculatus)* arcuate bush mallow	CNPS 1B
Arctostaphylos regismontana Kings Mountain manzanita	CNPS 1B	*Pedicularis dudleyi* Dudley's lousewort	CR, CNPS 1B
Cirsium andrewsii Franciscan thistle	CNPS 1B	*Pentachaeta bellidiflora* white-rayed pentachaeta	FE, CE, CNPS 1B
Cirsium fontinale var. *fontinale* fountain thistle	FE, CE, CNPS 1B	*Plagiobothrys chorisianus* var. *chorisianus* Choris's popcorn-flower	CNPS 1B
Collinsia multicolor San Francisco collinsia	CNPS 1B	*Potentilla hickmanii* Hickman's cinquefoil	FE, CE, CNPS 1B
Dirca occidentalis western leatherwood	CNPS 1B	*Silene verecunda* ssp. *verecunda*	CNPS 1B

Table 4-1: Special-status Plant Species with Potential to Occur in the Project Area

COMMON NAME, SCIENTIFIC NAME	STATUS	COMMON NAME, SCIENTIFIC NAME	STATUS
		Mission Delores (=San Francisco) campion	
Elymus californicus California bottle-brush grass	CNPS 4	*Trifolium depauperatum* var. *hydrophilum* water sack (=saline) clover	CNPS 1B
Eriophyllum latilobum San Mateo woolly sunflower	FE, CE, CNPS 1B	*Triphysaria floribunda* San Francisco owl's clover	CNPS 1B
Fritillaria biflora var. *ineziana* (=*F. grayana*) Hillsborough chocolate lily (= Gray's fritillary)	CNPS 1B	*Tropidocarpum capparideum* caper fruited tropidocarpum	CNPS 1B

Codes

FT:	Federally listed as Threatened
FE:	Federally Endangered
CT:	State of California Threatened
CE:	State of California Endangered
CR:	State of California Rare
CNPS:	California Native Plants Society
1B:	Rare, threatened or endangered in California and elsewhere.
4:	Plants of Limited Distribution – a watch list

A list of special-status species with potential to occur in the Project Area was compiled through reviews of a number of sources, including available literature, related databases, and the Internet. Sources included a review of California Department of Fish and Game's (CDFG) California Natural Diversity Database (CNDDB) (CDFG 2006a), as well as the US Fish and Wildlife Service (USFWS) Sacramento District website (USFWS 2006). Both the CNDDB and the USFWS website were queried by 7.5-minute quadrangle. The list of Project quadrangles (quads) included Montara Mountain, San Mateo, and Woodside. Additional species were included in the analysis, based on known distribution, habitat requirements, and/or incidental sightings. Species with potential to occur in the project area for which habitat, including foraging habitat, is present in the project area are evaluated in the following sections. The following section provides a description of special-status plant species potential to occur in the Project Area. Species information was derived from the CNDDB (CDFG 2006a), the CNPS Inventory (CNPS 2001, CNPS 2006), Munz and Keck (1968), and Hickman (1993). Listing status for each species was confirmed by CDFG's Special Vascular Plants, Bryophytes, and Lichens list (CDFG 2006c). Other sources are indicated where relevant.

A total of eight special-status plant species were observed during surveys of the Project Area in 2006. These species are fountain thistle (*Cirsium fontinale* var. *fontinale*), Marin western flax (*Hesperolinon congestum*), Franciscan onion (*Allium peninsulare* var. *franciscanum*), San Francisco collinsia (*Collinsia multicolor*), western leatherwood (*Dirca occidentalis*), California bottle-brush grass (*Elymus californicus*), Crystal Springs lessingia (*Lessingia arachnoidea*), and arcuate bush mallow (*Malacothamnus arcuatus* [=*M. fasciculatus*]). All surveyed populations are associated with woodland, scrub, or grassland communities adjacent to the ordinary high water line of Upper and Lower Crystal Springs Reservoirs.

4.1.1 Federally-listed Plant Species

As mentioned in Section 4.1, six federally-listed plant species potentially occur in the Project Area, based on habitats as described in the literature. These species are San Mateo thorn-mint (*Acanthomintha duttonii*), fountain thistle, San Mateo woolly sunflower (*Eriophyllum latilobum*), Marin western flax, white-rayed pentachaeta (*Pentachaeta bellidiflora*), and Hickman's cinquefoil (*Potentilla hickmanii*) (CDFG 2006c).

San Mateo Thorn-mint (*Acanthomintha duttonii*) – FE, CE, CNPS 1B

San Mateo thorn-mint was known as *Acanthomintha obovata* var. *duttonii* when it was federally listed (Federal Register 1985). This species is an annual herb found in chaparral, valley and foothill grasslands, and coastal scrub. It is both federally and state listed as endangered, and is categorized by the CNPS as a List 1B species. Extant populations are only known from very uncommon serpentinite vertisol clays in relatively open areas. San Mateo thorn-mint is most commonly found in elevations ranging from 165 to 660 feet, blooming from April to June (CNPS 2001). This species is known to occur in the vicinity of the Project, near Hwy 280 and Edgewood county road (GGNPA 2001), but it was not observed in the Project Area during surveys in 2006.

Critical Habitat

No critical habitat has been designated or proposed for San Mateo thorn-mint.

Fountain Thistle (*Cirsium fontinale* var. *fontinale*) – FE, CE, CNPS 1B

Fountain thistle is a perennial herb that is federally and state listed as endangered and is categorized by the CNPS as a List 1B species. Blooming from June to October, the species is known to occur in valley and foothill grassland and chaparral. It is also commonly found in serpentine seeps and grasslands from 295 to 590 feet in elevation. Several known occurrences were reported in the vicinity of the Crystal Springs Reservoir (CDFG 2006a, GGNPA 2001). Fountain thistle was found at three locations during surveys of the Project Area in 2006, occupying a total area of 0.38 acre (Appendix F). More than 1,033 individuals were observed at these locations, but some were above the 291.8 foot (NGVD 1929)[1] elevation.

Critical Habitat

No critical habitat has been designated or proposed for fountain thistle.

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[1] The National Geodetic Vertical Datum of 1929: A vertical control datum established for vertical control in the United States by the general adjustment of 1929.

San Mateo Woolly Sunflower (*Eriophyllum latilobum*) – FE, CE, CNPS 1B

San Mateo wooly sunflower is federally and state listed as endangered, and is a CNPS List 1B species. This perennial herb blooms from May to June (CNPS 2001), and commonly occurs in cismontane woodland. Often located on roadcuts, and on and off serpentine outcroppings at elevations from 150 to 490 feet, this species is known to occur within one mile of the Project Area. However, it was not observed during surveys in 2006.

Critical Habitat

No critical habitat has been designated or proposed for San Mateo wooly sunflower.

Marin Western Flax (*Hesperolinon congestum*) – FT, CT, CNPS 1B

Marin western flax is a federal and state threatened species, as well as a CNPS List 1B species. This species is an annual herb blooming from April through July, in chaparral, valley and foothill grassland habitats. The species is commonly found in serpentine barrens and in serpentine grassland and chaparral, from 100 to 1,200 feet in elevation. There are several known occurrences of Marin western flax within the Project Area (GGNPA 2001). Marin western flax was found at four locations in grasslands during surveys of the Project Area in 2006, occupying a total area of 0.13 acre (Appendix F). More than 640 individuals were observed at these locations, but many were above the 291.8 foot elevation.

Critical Habitat

No critical habitat has been designated or proposed for Marin western flax.

White-rayed Pentachaeta (*Pentachaeta bellidiflora*) – FE, CE, CNPS 1B

The white-rayed pentachaeta is a federal and state endangered species, as well as a CNPS List 1B species. An annual herb that blooms from March to May in valley and foothill grasslands, this species often occurs in open dry rocky slopes and grassy areas, often on soils derived from serpentine bedrock. This species is found in elevations ranging from 115 to 2,035 feet. There is a known occurrence of this species in the vicinity of the Project, near Hwy 280 and Edgewood county road (GGNPA 2001). Although there is suitable white-rayed pentachaeta habitat in grasslands and serpentine soils, it was not observed during surveys in 2006.

Critical Habitat

No critical habitat has been designated or proposed for white-rayed pentachaeta.

Hickman's Cinquefoil *(Potentilla hickmanii)* – FE, CE, CNPS 1B

Hickman's cinquefoil is federally and state listed as endangered and is a CNPS List 1B species. A bulbiferous perennial herb, this species blooms from April to August in habitats such as coastal bluff scrub, closed-cone coniferous forest, meadows, seeps, marshes, and swamps. It is often spotted from elevations of 15 to 405 feet, in freshwater marshes, seeps, and small streams in open or forested areas along the coast. The species has become seriously threatened due to urbanization, recreational activities, non-native grasses, and heavy grazing. Mixed evergreen forest and freshwater marsh communities within the Project Area provide suitable habitat for this species. However, it was not observed during surveys in 2006. The nearest reported populations is 6.5 miles to the west at Moss Beach.

Critical Habitat

No critical habitat has been designated or proposed for Hickman's cinquefoil.

4.1.2 Other Special-status Plant Species

Twenty special-status plant species that are not federally listed or proposed for listing potentially occur in the Project Area. These plants are Franciscan onion (*Allium peninsulare* var. *franciscanum)*, bent-flowered fiddleneck (*Amsinckia lunaris*), Santa Cruz manzanita (*Arctostaphylos andersonii*), Montara manzanita (*Arctostaphylos montaraensis*), Kings Mountain manzanita (*Arctostaphylos regismontana*), Franciscan thistle (*Cirsium andrewsii*), San Francisco collinsia, western leatherwood, California bottle-brush grass, Hillsborough chocolate lily (= Gray's fritillary) (*Fritillaria biflora* var. *ineziana* [=*F. grayana*]), fragrant fritillary (*Fritillaria liliacea*), San Francisco gumplant (*Grindelia hirsutula* var. *maritima*), Crystal Springs lessingia, arcuate bush mallow, Dudley's lousewort (*Pedicularis dudleyi*), Choris's popcorn-flower (*Plagiobothrys chorisianus* var. *chorisianus*), Mission Delores (=San Francisco) campion (*Silene verecunda* ssp. *verecunda*), water sack (=saline) clover (*Trifolium depauperatum* var. *hydrophilum*), San Francisco owl's clover (*Triphysaria floribunda*), and caper fruited tropidocarpum (*Tropidocarpum capparideum*).

Franciscan Onion (*Allium peninsulare* var. *franciscanum*) – CNPS 1B

Franciscan onion, a CNPS List 1B species, is a bulbiferous perennial herb. It is commonly associated with cismontane woodland, as well as valley and foothill grassland habitats. Franciscan onion is often found on dry hillsides with clay soils or on serpentine outcrops. This herb blooms from May to June, and generally occurs from 330 to 985 feet in elevation. There is a potential for this herb to occur within the Project Area based on available habitat, including serpentine outcrops and dry hillsides with clay soils... Franciscan onion was found at five locations during surveys of the Project Area in 2006, occupying a total area of 1,360 square feet (0.03 acre) (Appendix F). More than 216 individuals were observed at these locations.

Bent-flowered Fiddleneck (*Amsinckia lunaris*) – CNPS List 1B

Bent-flowered fiddleneck is an annual herb blooming from March to June, from 165 to 1,640 feet in elevation. It is a CNPS List 1B species, found in cismontane woodland, as well as in valley and foothill grassland. Coast live oak woodland and non-native grassland within the Project Area provide suitable habitat for this species, but it was not observed during surveys in 2006.

Santa Cruz Manzanita *(Arctostaphylos andersonii)* – CNPS 1B

This evergreen shrub is a CNPS List 1B species, associated with broadleaved upland forest, chaparral, and north coast coniferous forest. It is commonly found from 590 to 2,625 feet in elevation, blooming from November to April in open sites and near redwood forest. Woodland

and chaparral communities within the Project Area provide suitable habitat for this species, but it was not observed during surveys in 2006.

Montara Manzanita (*Arctostaphylos montaraensis*) – CNPS 1B

Montara manzanita is an evergreen shrub ranging in height from 3 to 15 feet and blooming between January and March. It is a CNPS List 1B species, found in chaparral and coastal scrub along slopes and ridges, from 490 to 1,640 feet in elevation. This species was not observed during surveys in 2006, though habitat for it is present within chaparral communities occurring in the Project vicinity, and it is known to occur within a mile of the Project Area (GGNPA 2001).

Kings Mountain Manzanita (*Arctostaphylos regismontana*) – CNPS 1B

Kings Mountain manzanita is an evergreen, tree-like shrub ranging from 6 to 12 feet in height. It is a CNPS List 1B species, common to broadleaved upland forest, chaparral, and north coast coniferous forests. This species blooms from January to April, and is often found on granitic or sandstone outcrops at elevations of 1,000 to 2,400 feet. Woodland and chaparral communities within the Project Area provide suitable habitat for this species, but it was not observed during surveys in 2006.

Franciscan Thistle (*Cirsium andrewsii*) – CNPS 1B

Franciscan thistle is a CNPS List 1B species, that is a biennial (or short-lived perennial) herb, blooming from March through July. Common habitat conditions include coastal bluff scrub, broadleaved upland forest and coastal scrub. It is occasionally found on serpentine seeps, bluffs, and ravines at elevations from sea level to 440 feet. Woodland and chaparral communities within the Project Area provide suitable habitat for this species, but it was not observed during surveys in 2006.

San Francisco Collinsia (*Collinsia multicolor*) – CNPS 1B

San Francisco collinsia is an annual herb, blooming from March through May, that is categorized by the CNPS as a List 1B species. This species is common in closed-cone coniferous forest and coastal scrub, and is often found on decomposed shale (mudstone) mixed with humus. It can be found at elevations ranging from 100 to 820 feet. San Francisco collinsia was found at three locations during surveys of the Project Area in 2006, occupying a total area of 0.38 acre (Appendix F). Approximately 620 individuals were observed at these locations, but many were above the 291.8 foot elevation.

Western Leatherwood (*Dirca occidentalis*) – CNPS 1B

Western leatherwood is a deciduous shrub occurring in broadleaved upland forest, chaparral, closed-cone coniferous forest, cismontane woodland, north coast coniferous forest, riparian forest, and riparian woodland habitat types. This CNPS List 1B species blooms from January to April and is often found on mesic sites and brushy slopes, mostly in mixed evergreen and foothill woodland communities from 100 to 1,805 feet in elevation. Western leatherwood was found at three locations during surveys of the Project Area in 2006, occupying a total area of 0.1 acre

(Appendix F). Twenty-eight individuals were observed at these locations, but many were above the 291.8 foot elevation.

California Bottle-brush Grass (*Elymus californicus*) – CNPS 4

California bottle-brush grass is a North Coast native found in coastal coniferous forests, cismontane woodlands, and riparian woodlands. This CNPS List 4 species often grows in sandy humus soils at elevations of 50 to 1,490 feet. California bottle-brush grass is known to occur extensively on the western side of Lower Crystal Springs Reservoir (GGNPA 2001). This grass was observed in mixed evergreen forest during surveys of the Project Area in 2006 (Appendix F). Over 1,000 plants of this species were recorded, but some may be above the 291.8 foot elevation.

Hillsborough Chocolate Lily (*Fritillaria biflora* var. *ineziana*) – CNPS 1B

Hillsborough chocolate lily is a bulbiferous perennial herb that blooms from March to April, and is a CNPS List 1B species known only from the Hillsbrorough area. This lily is common in cismontane woodland and valley and foothill grassland at elevations ranging from 295 to 525 feet, and is also occasionally associated with serpentine grassland. Although there is suitable habitat for this species in the Project Area, the species was not observed during surveys in 2006.

Fragrant Fritillary (*Fritillaria liliacea*) – CNPS 1B

The fragrant fritillary, a CNPS List 1B species, is a bulbiferous perennial herb that blooms from February to April in habitat such as coastal scrub, valley and foothill grassland, and coastal prairies. This species is often found on serpentine outcrops and primarily on clay soils, though a variety of soils have also been reported. This species has an elevation range of 10 to 1,345 feet, and occurrences for this species have been recorded directly adjacent to Upper Crystal Springs Reservoir (GGNPA 2001). Grassland communities within the Project Area provide suitable habitat for this species, but it was not observed during surveys in 2006.

San Francisco Gumplant (*Grindelia hirsutula* var. *maritima*) – CNPS 1B

San Francisco gumplant is a bulbiferous perennial herb that is currently listed as CNPS List 1B species. Associated with habitat types of coastal scrub and coastal bluff scrub, as well as valley and foothill grasslands, this species is often found on sandy or serpentine slopes and sea bluffs from 50 to 1,310 feet in elevation. This species blooms from August through September, but there is a very low potential for this species to occur in the Project Area based on distance from the coast. However, there remains some potential for occurrence in serpentine grasslands and coastal scrub communities within the Project Area. Although there is suitable habitat for this species, it was not observed during surveys in 2006.

Crystal Springs Lessingia (*Lessingia arachnoidea*) – CNPS 1B

Crystal Springs lessingia, a CNPS List 1B species, is an annual herb blooming from July to October, within habitats of coastal sage scrub, valley and foothill grassland, and cismontane woodland. This species has an elevation range of 200 to 655 feet, and is often associated with grassy slopes on serpentine, and occasionally along roadsides.

Crystal Springs lessingia was found at nine locations during surveys of the Project Area in 2006, occupying a total area of 5.42 acres (Appendix F). Approximately 5,800 lessingia plants were observed at these locations, but some may be above the 291.8 foot elevation.

Arcuate Bush Mallow (*Malacothamnus arcuatus*) – CNPS 1B

Arcuate bush mallow, a CNPS List 1B species, is an evergreen shrub. The species blooms from April to September, generally occurring in chaparral communities and primarily on gravelly alluvium, at elevations from 260 to 1,165 feet. Arcuate bush mallow was found at three locations during surveys of the Project Area in 2006, occupying a total area of 85 square feet (Appendix F). Eight bush mallow plants were observed at these locations.

Dudley's Lousewort (*Pedicularis dudleyi*) – CR, CNPS 1B

Dudley's lousewort is California state rare species and CNPS List 1B species. A perennial herb blooming from April to June, the species is often found in deep shady woods of older coast redwood forests. Common habitats include chaparral (maritime), cismontane woodland, north coast coniferous forest and valley and foothill grassland from 200 to 2,950 feet. There is potential for this species to occur in grassland and woodland habitats within the Project Area, but it was not observed during surveys in 2006.

Choris's Popcorn-flower (*Plagiobothrys chorisianus* var. *chorisianus*) – CNPS 1B

This annual herb is a CNPS List 1B species found in chaparral, coastal scrub, and coastal prairie habitats, and mesic sites. Blooming from March through June, this species is known to occur at elevations ranging from 50 to 330 feet. There is suitable habitat available for this species in coastal scrub communities within the Project Area, but it was not observed during surveys in 2006.

Mission Delores Campion (*Silene verecunda* ssp. *verecunda*) – CNPS 1B

Mission Delores (or San Francisco) campion is a bulbiferous perennial herb that is a CNPS List 1B species. This species blooms from March to August, at elevations ranging from 100 to 2,115 feet, and is associated with a variety of habitats including coastal scrub, valley and foothill grassland, coastal bluff scrub, chaparral, and coastal prairie. Microsite conditions include mudstone or shale substrate and sandy soils. Though it is rare, the species is occasionally found on serpentine substrate. Although there is suitable habitat for this species in grassland, coastal scrub, and chaparral, it was not observed during surveys in 2006.

Water Sack Clover (*Trifolium depauperatum* var. *hydrophilum*) – CNPS 1B

Water sack clover is an annual herb found in marshes and swamps, valley and foothill grassland, and vernal pools. A CNPS List 1B species, this species blooms from April to June, at elevations ranging from sea level to 985 feet. This species is often found on mesic, alkaline sites. Freshwater marsh and grassland communities within the Project Area provide suitable habitat for this species, but it was not observed during surveys in 2006.

San Francisco Owl's Clover (*Triphysaria floribunda*) – CNPS 1B

San Francisco owl's clover, a CNPS List 1B, is an annual herb blooming from April to June. Common habitat types include coastal prairie, coastal scrub, and valley and foothill grassland. The species is found on both serpentine and non-serpentine substrate from 35 to 525 feet. There is a potential for this species to occur in within the Project Area. Although there is suitable habitat for this species in grassland and coastal scrub habitats, it was not observed during surveys in 2006.

Caper Fruited Tropidocarpum (*Tropidocarpum capparideum*) – CNPS 1B

Caper-fruited tropidocarpum is an annual herb, categorized by the CNPS as a List 1B species. Historically, this species was often found blooming between March and April, in valley foothill grassland, on primarily alkaline hills and alkaline clay. This species was thought to be extinct after a 1957 report, but was rediscovered at Fort Hunter Liggett in Monterey County in 2000 and has since been found in San Luis Obispo County. The reported elevation range for the species is from sea level to 1,490 feet. There is very low potential for this species to occur in the vicinity of the Project; however, appropriate habitat does exist in grassland communities within the Project Area. Caper-fruited tropidocarpum was not observed during surveys in 2006.

4.2 Special-status Terrestrial Wildlife Species

Searches of the CNDDB and other literature sources resulted in a lengthy list of wildlife species that could occur in the Project quadrangles (CDFG 2006a, USFWS 2006), including marine species and others for which no habitat is present in the Project Area. Appendix A (Table A-2) provides a tabulation of the scientific and common names of these species, as well as listing status, general habitat conditions, and potential to occur in the Project Area. Special-status terrestrial wildlife species for which habitat may be present in the Project Area include 9 federally-listed species and 27 other species. A list of these animals is presented in Table 4-2.

Table 4-2: Special-status Terrestrial Wildlife Species with Potential to Occur in the Project Area)

COMMON NAME, SCIENTIFIC NAME	STATUS	COMMON NAME, SCIENTIFIC NAME	STATUS
Invertebrates			
San Bruno elfin butterfly *Callophrys mossii bayensis*	FE	Monarch butterfly *Danaus plexippus*	
Bay checkerspot butterfly *Euphydryas editha bayensis*	FT	Mission blue butterfly *Plebejus icarioides missionensis*	FE
Myrtle's silverspot *Speyeria zerene myrtleae*	FE		
Amphibians			
California tiger salamander *Ambystoma californiense*	FT, CSC		

Table 4-2: Special-status Terrestrial Wildlife Species with Potential to Occur in the Project Area)

COMMON NAME, SCIENTIFIC NAME	STATUS	COMMON NAME, SCIENTIFIC NAME	STATUS
Reptiles			
San Francisco garter snake *Thamnophis sirtalis tetrataenia*	FE, CE		
Birds			
Cooper's hawk *Accipiter cooperi*	CSC	Tricolored blackbird *Agelaius tricolor*	CSC
Bell's sage sparrow *Amphispiza belli belli*	CSC	Western burrowing owl *Athene cunicularia hypugaea*	CSC
Marbled murrelet *Brachyramphus marmoratus*	FT, CE	Ferruginous hawk *Buteo regalis*	CSC
Vaux's swift *Chaetura vauxi*	CSC	Western snowy plover *Charadrius alexandrinus nivosus*	FT, CSC
Black swift *Cypseloides niger*	CSC	Little willow flycatcher *Empidonax traillii brewsteri*	SE
American peregrine falcon *Falco peregrinus anatum*	FD, CE	Saltmarsh common yellowthroat *Geothlypis trichas sinuosa*	CSC
Bald eagle *Haliaeetus leucocephalus*	CE	Loggerhead shrike *Lanius ludovicianus*	CSC
California black rail *Laterallus jamaicensis coturniculus*	CT	Long-billed curlew *Numernius americanus*	CSC
Osprey *Pandion haliaetus*	CSC	Double-crested cormorant *Phalacrocorax auritus*	CSC
Bank swallow *Riparia riparia*	CT	Black skimmer *Rynchops niger*	CSC
California least tern *Sterna antillarum browni*	FE, CE	Elegant tern *Sterna elegans*	CSC
Mammals			
Pallid bat *Antrozous pallidus*	CSC	Pacific western big-eared bat *Corynorhuinus (Plecotus) townsendii townsendii*	CSC
Santa Cruz kangaroo rat *Dipodomys venustus venustus*	CSC	Greater western mastiff bat *Eumops perotis californicus*	CSC
San Francisco dusky-footed woodrat *Neotoma fuscipes annectens*	CSC	Big free-tailed bat *Nyctinomops macrotis*	CSC
American badger *Taxidea taxus*	CSC		

Codes

FT:	Federally listed as Threatened
FE:	Federally Endangered
FD:	formerly federally listed, but since de-listed
CE:	State of California Endangered
CSC:	California species of concern

4.2.1 Federally-listed Terrestrial Wildlife Species

Ten federally-listed terrestrial wildlife species potentially occur in the Project Area. These species are San Bruno elfin butterfly (*Callophrys mossii bayensis*), bay checkerspot butterfly (*Euphydryas editha bayensis*), Mission blue butterfly (*Plebejus icarioides missionensis*), Myrtle's silverspot (*Speyeria zerene myrtleae*), California tiger salamander (*Ambystoma californiense*), San Francisco garter snake (*Thamnophis sirtalis tetrataenia*), marbled murrelet (*Brachyramphus marmoratus*), western snowy plover (*Charadrius alexandrinus nivosus*), bald eagle (*Haliaeetus leucocephalus*), , and California least tern (*Sterna antillarum browni*).

San Bruno Elfin Butterfly (*Callophrys mossii bayensis*) FE

The San Bruno elfin butterfly is federally listed as endangered (Federal Register 1976). This species inhabits rocky outcrops and cliffs in coastal scrub on the San Francisco Peninsula. Its patchy distribution reflects that of its host plant, stonecrop (*Sedum spathulifolium*). Adults of this butterfly emerge in early spring (February and March), when flowers that provide their nectar diet begin to open. They mate soon thereafter, and the female must locate appropriate host plants on which to deposit her eggs. The eggs typically hatch within a week. The tiny larvae first feed on the plant's vegetative structures. However, when the stonecrop's flowers begin to open, the larvae migrate upward and feed on the flowers themselves. By June most have completed their larval development at which time they leave the host plant to pupate in ground litter. They lie dormant as pupae until the following spring, when the cycle begins again (Essig Museum 2006).

The San Bruno elfin butterfly is restricted to a few small populations, the largest of which occurs on San Bruno Mountain. Its habitat has been diminished in the past by quarrying, off-road recreation, and urban development. Development pressures on the San Francisco Peninsula continue to grow (Essig Museum 2006). The nearest recorded location of this butterfly to the Project Area is one-half mile to the northwest.

Pacific stonecrop (*Sedum spathulifolium*) is a host plant to the larvae of the San Bruno elfin butterfly. Pacific stonecrop is a perennial herb with a preferred habitat of rocky places in coniferous and mixed evergreen forests, below 7,500 feet in elevation. There is suitable habitat for Pacific stonecrop in mixed evergreen forest on the western shore of Lower Crystal Springs Reservoir, but it was not observed during surveys in 2006.

Critical Habitat

Critical habitat was proposed for the San Bruno elfin butterfly on February 8, 1977 (Federal Register 1977), but a final determination on critical habitat for this species had not been made. Proposed critical habitat for this butterfly is outside of the Project Area, in the San Bruno Mountains to the north.

Bay Checkerspot Butterfly (*Euphydryas editha bayensis*) – FT

The bay checkerspot butterfly is federally listed as threatened (Federal Register 1987). This butterfly utilizes more than one larval host plant species. Following mid-spring mating, the female butterflies lay their eggs on a native plàntain (*Plantago erecta*). The eggs hatch and the larvae feed on this host until either they have developed to a point at which they may enter dormancy, or the host has begun to dry up from the summer heat. If the plantain is not sufficient for development, the larvae may move onto one of two species of owl's clover (*Castilleja densiflorus* or *C. exserta*) which remain palatable for a longer period. Generally, one season is not sufficient for completion of development and the larvae must enter dormancy until the following winter when the rains allow plant growth to begin again. The larvae then emerge to feed for a little longer, eventually pupating in late winter. The adults emerge shortly thereafter (Essig Museum 2006).

Historically, the bay checkerspot butterfly inhabited numerous areas around the San Francisco Bay, including the San Francisco Peninsula, the mountains near San Jose, the Oakland Hills, and several spots in Alameda County. Most of these habitation areas have apparently disappeared due to the explosive development of the San Francisco Bay Area in the past century. Populations are now known only in San Mateo and Santa Clara counties. Changing disturbance regimes (i. e., fire and grazing) as well as introduced grassland plants have caused declines in host plant populations. In Santa Clara County, much of the butterfly's habitat is on property owned by a landfill corporation. In exchange for conscientious and permitted development of a small portion of this habitat in order to protect a large fraction of it, an agreement worked out among the owner, the City of San Jose, and conservation advocates has resulted in the protection of much of this habitat. In addition, the landowner has provided funding for the establishment of a butterfly preserve and for research toward successful management of the bay checkerspot butterfly (Essig Museum 2006).

California plantain (*Plantago erecta*) is a host plant for the Bay checkerspot butterfly. California plantain is an annual herb that is common in dry, open places below 2,500 feet in elevation. Habitats include coastal sage scrub, grassland, and chaparral. This plantain was observed intermittently in the Project Area in the non-native grassland vegetation community during surveys in 2006.

Owl's clover (*Orthocarpus densiflorus [=Castilleja densiflorus]* and *Orthocarpus purpurscens [=Castilleja exserta]*) are secondary host plants for the bay checkerspot butterfly. Both species of owl's clover are annual herbs. *Orthocarpus purpurscens* generally occurs in open fields, grassy slopes below 3,000 feet in elevation. Common habitats are grassland, coastal sage scrub, and foothill woodland. *Orthocarpus densiflorus* is common in grassy places below 2,500 feet. It occurs in several habitats, including foothill woodland, mixed evergreen forest and northern coastal scrub. Both species of owl's clover are relatively common in grassland communities, and are likely to occur in the Project Area.

A few specimens of owl's clover (*Castilleja exserta*) were observed in grassland habitat on the eastern shore of Upper Crystal Springs Reservoir during surveys in 2006. An unidentified species of checkerspot butterfly was observed during the reconnaissance-level wildlife survey. The nearest recorded location for this butterfly to the Project Area is 1.8 miles to the southeast.

Critical Habitat

Critical habitat was designated for bay checkerspot butterfly on April 30, 2001 (Federal Register 2001).

Mission Blue Butterfly (*Plebejus icarioides missionensis*) – FE

The Mission blue butterfly is federally listed as endangered (Federal Register 1976). This butterfly inhabits coastal grasslands and coastal scrub habitats that support perennial lupines, which provide food for the larvae. Specific larval host plants include silver bush lupine (*Lupinus albifrons*), varied lupine (*Lupinus variicolor*), and summer lupine (*Lupinus formosus*) (Thelander 1994, Scott 1986). The primary nectar plants for adults are coast buckwheat (*Eriogonum latifolium*), hairy false goldenaster (*Heterotheca villosa*), ookow (*Dichelostemma congestum*), and Ithuriel's spear (*Triteleia laxa*). Adult butterflies can be observed from late March to early July (Scott 1986). Single eggs are deposited on leaves, stems, flowers, and seed pods of lupine species (Scott 1986). Caterpillars feed on leaves after hatching 6 to 10 days later. Dormancy occurs three weeks later with adults emerging the following spring after winter dormancy (Scott 1986). This species occurs in San Mateo County, Twin Peaks in San Francisco, and the southern end of Marin County.

This butterfly uses three larval host plants: silver bush lupine (*Lupinus albifrons*), varied lupine (*Luinus variicolor*), and summer lupine (*Lupinus formosus*), of which silver bush lupine is favored. Summer lupine is a perennial herb that occurs in dry open fields and sandy places, mostly below 2,500 feet, but up to 9,000 feet in elevation. Varied lupine is a shrub that is known to occur in various coastal plant communities, including coastal strand and northern coastal scrub. The preferred habitat for varied lupine is grassy fields, slopes, and sand dunes below 1,000 feet in elevation. Silver bush lupine is a shrub that is found in sandy and rocky places, in many communities below 5,000 feet in elevation.

Five small individuals of *Lupinus albifrons* var. *collinus* were observed on the eastern shore of Lower Crystal Springs Reservoir during surveys in 2006. The nearest recorded location of the Mission blue butterfly to the Project Area is 1.8 miles to the northeast, below San Andreas Lake.

Critical Habitat

Critical habitat was proposed for the Mission blue butterfly on February 8, 1977 (Federal Register 1977), but a final determination on critical habitat for this species has not been made. Proposed critical habitat for this butterfly is outside of the Project Area, in the San Bruno Mountains and the Twin Peaks area of San Francisco to the north.

Myrtle's Silverspot Butterfly (*Speyeria zerene myrtleae*) – FE

Myrtle's silverspot butterfly is federally listed as endangered (Federal Register 1992a). This species is restricted to areas immediately adjacent to the coast, which include dunes, scrub, and grasslands (Essig Museum 2006). Adults of Myrtle's silverspot appear throughout the late summer and early fall. Adults live for about three weeks during which time their activities include feeding on nectar, mating, and laying eggs. The eggs are laid only on species of *violet* (possibly only *Viola adunca*), and hatch in the fall. Most of the larval feeding, however, occurs in the spring when the majority of the violet's growth takes place. The adults emerge following a two-week pupation (Essig Museum 2006).

Western dog violet (*Viola adunca*) is perennial herb common to damp banks and meadow edges adjacent to forest communities, from elevations of 25 to 8,500 feet. Forest communities in the Project Area provide suitable habitat for the western dog violet, but it was not observed during surveys in 2006. Johnny-jump-up (*Viola pedunculata*) was observed in the Project Area. The nearest recorded location of this butterfly to the Project Area is 2.3 miles to the east.

Critical Habitat

No critical habitat has been designated or proposed for the Myrtle's silverspot butterfly.

California Tiger Salamander (*Ambystoma californiense*) -- FT, CSC

The California tiger salamander is federally listed as threatened (Federal Register 2004), and is a California species of special concern (CDFG 2006b). California tiger salamander habitat has two distinct components. The most obvious and best known habitat comprises rain pools used for spawning. But far more important for the survival of individuals and colonies is the presence of burrow complexes of California ground squirrel and Botta's pocket gopher in grasslands and sparse oak woodlands. This salamander spends about 80 to 90 percent of the year in mammal burrows (which prevent desiccation during the hot dry summer season), a condition that is characteristic of the majority of the species' range in California. Typically, California tiger salamanders emerge from rodent burrows several times on rainy nights during the autumn and winter, and migrate to traditional spawning pool sites filled by winter rains (Stebbins 1951). Eggs are deposited singly or in small clusters on submerged plant stems, hatching within a few days. After spawning, the adult salamanders return to the rodent burrow complexes, and move deep underground. The cycle commences again with the first heavy rains of autumn. Larvae metamorphose in late spring, not long before the spawning pools begin to dry out.

The Project Area includes both seasonal wetlands areas with small mammal burrows suitable for tiger salamander aestivation. However, the nearest report of this species is 4.6 miles to the south in the San Franscisquito Creek watershed.

Critical Habitat

Critical habitat has been designated for the Central population of the California tiger salamander by USFWS, but the Project Area does not include any critical habitat areas (Federal Register 2005a).

San Francisco Garter Snake (*Thamnophis sirtalis tetretaenia*) – FE, CE

The San Francisco garter snake is federally listed and state listed as endangered, and is a California fully protected species (Federal Register 1967, CDFG 2006b). The San Francisco garter snake, a distinctive subspecies of the common garter snake, is restricted to the San Francisco Peninsula. Adults of these snakes average about 32 inches in total length, but large females may reach 48 inches (Barry 1994). These unique snakes are marked with multiple lateral stripes of black, blue, and red, with a light green dorsal stripe, a red head, and an intense turquoise blue belly. San Francisco garter snake populations are known to exist in approximately 60 sites in San Mateo County and one site in Santa Cruz County (Barry 1994). Hybrid or "intergrade" populations (with the California red-sided garter snake [*Thamnophis sirtalis* *infernalis*]) of natural and artificial origins are known to exist in Marin County, northwestern Santa Clara County, southeastern San Mateo County, and in the vicinity of the San Francisco International Airport in northeastern San Mateo County (Barry 1994).

San Francisco garter snakes are most frequently encountered in the vicinity of dense riparian and emergent vegetation along the borders of ponds, lakes, and streams. It is a habitat specialist, historically occurring in the sag ponds and marshes found along the peninsula in San Mateo County and northern Santa Cruz County (Fox 1951). These snakes particularly favor sag and dune ponds, coastal freshwater marshes, meadowland streams with overhanging willows, and shallow reservoir coves with extensive vegetation, but some stock and irrigation ponds also support colonies (Barry 1978, 1994, 1996).

Riparian and aquatic sites are important because frogs, which comprise approximately 95 percent of San Francisco garter snake diet, are most common in such habitat (Barry 1994, 1996). Although most of their diet consists of Pacific chorus frogs, the larger ranid frog species including the native California red-legged frog and the exotic bullfrog are critical components of adult San Francisco garter snake diet. Prey items also include the California red-legged frog, Pacific tree frog (*Hyla regilla*), and California newt (*Taricha torosa*) and small mosquito fish (*Gambusia affinis*).

The dense vegetation generally present in such habitat also provides excellent cover and aids in thermoregulation (Barry 1978, 1994). Upland meadows are also present at all localities hosting San Francisco garter snake, and these meadows are usually contiguous with the riparian aquatic habitat component. Meadows offer basking habitat and hibernacula, which usually consist of rodent burrows and perhaps underground crevices and fissures (Barry 1994, Larsen 1994).

This species is known to occur within the Project Area (Barry 1994; CDFG 2005; CDFG 2006c; McGinnis 1998; Swaim Biological 2003, 2004, 2005).

Visual surveys conducted during the survey period resulted in the observation of eleven adult SFGS in 2006 and two in 2007 (Table 4-3). One of the observations was of the remains of an SFGS carcass contained in the scat of an unidentified mammal. Nine of the snakes were found in previously mapped marsh areas that are considered high potential for CRLF breeding habitat, including San Mateo Creek below LCSD. Two were found in areas between reservoir marshes and one was observed and captured at a sediment basin at the northwest corner of the intersection of Cañada Road and Edgewood Road, 3 km south of UCSR. Another was captured near a pond to the southwest of UCSR near the intersection of Interstate 280 and Canada Road.

One adult male SFGS was captured during trapping surveys at the on San Mateo Creek, below LCS, on 7 May 2007. This capture confirmed SFGS presence in the drainage, so trapping was discontinued on 9 May 2007.

Table 4-3: Results for San Francisco Garter Snake (SFGS) Surveys in the Project Vicinity

SFGS Observations in the Project Vicinity			
Observation Date	Age Class	Condition	Location[1]
1971-1983, 1994-1996			Tracy Lake, North Marsh
1998			Tracy Lake, North Marsh
2/3/2006	A	Alive	WET1- Tracy Lake
3/6/2007	A	Alive	WET1-Tracy Lake
2/7/2006	A	Alive	WET2- North Marsh
8/15/2006	A	Alive	WET2- North Marsh
1971-1983, 1994-1996			Wet 70- Wet 74 (southeast corner LCSR)
1988, 1997			Wet 73, 74 (approximately)
			Upper Crystal Springs Reservoir
1971-1983, 1994-1996			Marshes, Coves on East Side
8/25/2006	A	Alive	WET93
2/9/2006	A	Alive	WET100
3/8/2006	A	Alive	WET100
3/9/2006	A	Alive	WET100
8/3/2006	A	Alive	WET100
2/8/2006	A	Alive	WET111
10/4/2005	J	Alive	WET 102
3/17/2006	A	Dead	WET102
2/15/2006	A	Alive	EDGEWD
fall 2005			SFPUC Canada Rd at Edgewood Rd
3/15/2007	A	Alive	Homestead Pond
1991 or1992			LCHMP
3/24/2004	A	Alive	WET 102 (south of Flume at UCSR edge (Near LCHMP)
6/1/2004	A	Alive	LCHMP
6/2/2004	A	Alive	LCHMP
6/7/2004	A	Alive	LCHMP
6/18/2004	J	Alive	LCHMP
7/6/2004	A	Alive	LCHMP
5/30/2004	A	Alive	Mud Dam 1
5/30/2004	A	Alive	Mud Dam 1
6/1/2004	A	Alive	Mud Dam 1
6/2/2004	A	Alive	Mud Dam 1
6/3/2004	A	Alive	Mud Dam 1
6/4/2004	A	Alive	Mud Dam 1
6/26/2004	J	Alive	Mud Dam 1
5/6/2005	A	Alive	Spring Valley Rd, Just East of Pilarcitos Res.

Table 4-3: Results for San Francisco Garter Snake (SFGS) Surveys in the Project Vicinity

SFGS Observations in the Project Vicinity			
Observation Date	Age Class	Condition	Location[1]
3/18/2004	A	Alive	Pulgas Water Temple Parking lot
9/15/2004	A	Alive	Upper Crystal Springs

[1] see map in Appendix D for location code sites

Critical Habitat

No critical habitat has been designated or proposed for the San Francisco garter snake.

Marbled Murrelet (*Brachyramphus marmoratus*) – FT, CE

The marbled murrelet is federally listed as threatened (Federal Register 1992b), and is state listed as endangered. Murrelets occupy the near shore environment in the ocean and feed on zoöplankton, squid, and fish (primarily Pacific sand lance, northern anchovy, Pacific herring, smelt, and Pacific sardine). At sea, their distribution appears to vary between seasons, and requires more study (CDFG 2000a).

Their nesting habits remained an ornithological mystery until 1974 when a tree trimmer found a nestling high in an old-growth Douglas fir tree in Big Basin Redwoods State Park, located in the Santa Cruz Mountains of central California. This tree nesting habit is unique among alcids. Murrelets lay a single egg high in old-growth trees on large horizontal limbs. Most nest sites have been found in large intact stands of old-growth forest, but some nest sites have been found in smaller stands of large trees, or in areas where a few old-growth trees still exist in a second-growth landscape. Their nesting season runs from late March through mid-September (CDFG 2000a).

There is little potential for the marbled murrelet to occur within the Project Area, except as a rare incidental. Murrelets could potentially nest within the stands of Douglas fir on the western side of the reservoir. Little, if any, nesting habitat occurs within the expected inundation zone.

Critical Habitat

Critical habitat for the marbled murrelet was designated in 1996 (Federal Register 1996b). No critical habitat units are in the Project Area, but Critical Habitat Unit CA-13 is less than 3 miles south of the Project Area.

Western Snowy Plover (*Charadrius alexandrinus nivosus*) – FT, CSC

Western snowy plover is federally listed as endangered, and is a California species of special concern (Federal Register 1993, CDFG 2006b). It is a small shore bird that frequents sandy beaches on marine and estuarine shores, and the shores of large alkali lakes. In the San Francisco

Bay, it is also frequently found in salt ponds. Western snowy plover typically breeds in western and central North America along the Pacific Coast from southern Washington to southern Baja California (Page et al. 1995). This ground-nesting bird creates shallow depressions for egg-laying on dune-backed beaches, barrier beaches, salt evaporation ponds, and occasionally on beaches that are backed by bluffs (Page and Stenzel 1981). Along the Central Coast of California, breeding by western snowy plover typically occurs between early March and late August (Page et al. 1995).

There is a low potential for this species to occur within the Project Area, due to areas of marginal habitat and the relative proximity to known populations of snowy plover colonies. The nearest reported location for this species to the Project Area is 4.3 miles to the east, on the western shore of San Francisco Bay.

Critical Habitat

Critical habitat was proposed for western snowy plover on December 17, 2004 (Federal Register 2004). No proposed critical habitat units are in the Project Area.

California Least Tern (*Sterna antillarum browni*) – FE, CE

The California least tern is federally listed as endangered (Federal Register 1970a), and is also state listed as endangered (CDFG 2006b). The California least tern is found along the Pacific Coast of California, from San Francisco southward to Baja California. The California populations, where the least tern is federally listed as endangered, are localized and increasingly fragmented. Both the coastal and interior breeding populations of least terns winter broadly across the marine coastlines of Central and South America (Thompson et al. 1997).

California least terns nest in colonies on relatively open beaches kept free of vegetation by natural scouring from tidal action. Their nest is a simple scrape in the sand or in shell fragments. A typical clutch is two eggs, and both adults incubate and care for the young. They can re-nest up to two times if eggs or chicks are lost. Least terns are very gregarious, and forage, roost, nest, and migrate in colonies. Fall migration commences between the last week in July and first week in August. Several weeks before fall migration begins, adults and young wander along marine coastlines, congregating at prime fishing sites (Thompson et al. 1997).

Alameda Naval Air Station is the site of one of the largest and most successful breeding colonies in California, and the only substantive colony in central California. As part of the federal government's disposal of the military bases, the tern colony and surrounding wildlife habitat are being transferred to USFWS for management. Adjacent parts of the base are proposed for a variety of public uses. Area management and reuse plans are now being developed (CDFG 2000c).

The California least tern is unlikely to breed within the Project Area due to the distance from marine habitats. However, there is a limited potential for post-nesting individuals to forage in the Project Area. The nearest reported location is 6 miles to the east, on the western shore of San Francisco Bay.

Critical Habitat

No critical habitat has been designated or proposed for the California least tern.

4.2.2 Other Special-status Terrestrial Wildlife Species

As defined at the beginning of Section 4.1 twenty-four special-status terrestrial wildlife species that are not federally listed or proposed for listing potentially occur in the Project Area. Please be more specific about which lists these species come from and define those lists here or as a footnote. These species are monarch butterfly (*Danaus plexippus*), Cooper's hawk (*Accipiter cooperi*), tricolored blackbird (*Agelaius tricolor*), Bell's sage sparrow (*Amphispiza belli belli*), western burrowing owl (*Athene cunicularia hypugaea*), ferruginous hawk (*Buteo regalis*), Vaux's swift (*Chaetura vauxi*), black swift (*Cypseloides niger*), little willow flycatcher (*Empidonax traillii brewsteri*), American peregrine falcon (*Falco peregrinus anatum*), saltmarsh common yellowthroat (*Geothlypis trichas sinuosa*), loggerhead shrike (*Lanius ludovicianus*), California black rail (*Laterallus jamaicensis coturniculus*), long-billed curlew (*Numernius americanus*), double-crested cormorant (*Phalacrocorax auritus*), bank swallow (*Riparia riparia*), black skimmer (*Rynchops niger*), elegant tern (*Sterna elegans*), pallid bat (*Antrozous pallidus*), Pacific western big-eared bat (*Corynorhuinus [Plecotus] townsendii townsendii*), greater western mastiff bat (*Eumops perotis californicus*), San Francisco dusky-footed woodrat (*Neotoma fuscipes annectens*), big free-tailed bat (*Nyctinomops macrotis*), and American badger (*Taxidea taxus*).

Monarch Butterfly (*Danaus plexippus*)

The monarch butterfly is designated as a "special animal" by the CDFG. This is a general term for animals that are considered sensitive regardless of their legal protection status. This species is not listed as a threatened, endangered, proposed or candidate species by the USFWS or CDFG under the federal or state Endangered Species Acts. However, California law (Assembly Bill No. 167, September 1987) recognizes monarch butterfly over-wintering colonies as "special resources" in California, and they are thus protected. Accordingly, CDFG recognizes monarch butterfly winter roost sites as sensitive habitats. Over-wintering habitat for monarch butterflies is generally composed of large stands of trees, including eucalyptus (*Eucalyptus* spp.), Monterey pine (*Pinus radiata*), and Monterey cypress (*Cupressus macrocarpa*) that exhibit specific habitat characteristics (e.g. canopy density, protection from prevailing wind, special arrangement of roost trees, low temperature variation).

There are no reported observations of monarch butterfly over-wintering roosting habitat within the Project Area, and no suitable habitat was observed during the reconnaissance survey in 2006. The nearest known monarch roosts is approximately 2.5 miles northeast on the edge of the San Francisco Bay. Therefore, there is no potential for occurrence of winter roosts within the proposed Project Area.

Cooper's Hawk (*Accipiter cooperii*) – CSC

The Cooper's hawk is a California species of special concern (CDFG 2006b). This hawk is a yearlong resident throughout most of the wooded portion of the state. In addition, individuals that breed in more northern areas may winter in California. The Cooper's hawk, which can be found in elevations ranging from sea level to 1,065 feet, requires dense stands of live oak, riparian deciduous or other forest habitats near water when nesting. The breeding season begins in March and continues through August, with average clutch sizes of four to five eggs. During this period, the female incubates the eggs while the male provides food. The Cooper's hawk feeds primarily on small birds, particularly young birds during the nesting season. Their diet is supplemented with reptiles and amphibians. The Cooper's hawk is an ambush predator and will take prey from the ground, on branches, or in mid-flight (Johnsgard 1990). Hunting takes place in broken woodland and habitat edges. This hawk is seldom found in areas without dense tree stands (Zeiner et al. 1990a).

The large tracts of contiguous undisturbed oak and mixed hardwood forest within the Project Area could support breeding and resident Cooper's hawks. The Project Area also provides foraging resources for this species.

Tricolored Blackbird (*Agelaius tricolor*) – CSC

The tricolored blackbird is a California species of special concern (CDFG 2006b). This blackbird ranges throughout the Central Valley of California, typically nesting in colonies numbering several hundred. An adequate breeding ground for the tricolored blackbird requires open water, protected nesting substrate, and a foraging area with insect prey within a few miles of the colony. Foraging habitat for this species in all seasons includes pastures, agricultural fields, and dry seasonal pools; with occasional foraging ground in riparian scrub, marsh boarders, and grassland habitats. Egg laying generally begins within four days of the colony's arrival, with a single egg being laid per day, and clutch size is usually around three to four eggs. Tricolored blackbirds typically leave their wintering areas in late March and early April for breeding locations in Sacramento County, and throughout the San Joaquin Valley (Beedy and Hamilton 1997).

Within the Project Area, there is suitable perennial wetland vegetation (bulrush and tule reeds) to support breeding and wintering tricolored blackbirds. Tricolored blackbirds were observed during the wildlife surveys on May 4 and May 5, 2006.

Bell's Sage Sparrow (*Amphispiza belli belli*) – CSC

Bell's sage sparrow is a California species of special concern (CDFG 2006b). This subspecies is an uncommon to common but localized resident in the Coast Ranges of California from coastal Marin County and inland Trinity County southward through central Baja California (Martin and Carlson 1998). The Bell's sage sparrow breeds in dry chaparral and coastal sage scrub along coastal lowlands, inland valleys, and in lower foothills of local mountains in California (Grinnell and Miller 1944). They exhibit a preference for chamise chaparral (Unitt 1984). In addition, high overgrown chaparral stands generally have fewer sage sparrows than shorter shrubs recovering from recent fires (Burridge 1995).

Early successional chaparral is minimal within the Project Area. In addition, existing chaparral is of poor quality and dominated by exotic species. Therefore, there is limited potential for this species to occur.

Western Burrowing Owl (*Athene cunicularia hypugaea*) – CSC

The western burrowing owl is a California species of special concern (CDFG 2006b). This owl was formerly a common permanent resident throughout much of California. However, a decline that became noticeable in the 1940s has continued through to the present time (Grinnell and Miller 1944). The western burrowing owl is a yearlong resident of open dry grassland and desert habitats often associated with burrowing animals. They have also been found to inhabit grass, forb, and shrub stages of pinyon and ponderosa pine habitats. Western burrowing owls commonly perch on fence posts or atop mounds outside their burrows. Western burrowing owls are active both day and night, with a reduction of activity at the peak of the day. Western burrowing owls are opportunistic feeders, with large arthropods comprising a majority of their diet. Small mammals, reptiles, birds, and carrion are also important components of the burrowing owl's diet (Zeiner et al. 1990a). The nesting season of the burrowing owl occurs from February through August, with a peak in breeding occurring from April to May. Western burrowing owls nest in burrows in the ground, often utilizing abandoned nests of ground squirrel or other small mammal. However, western burrowing owls may dig their own nests in areas of soft soil. Pipes, culverts, and nest boxes are also used in areas where burrows are scarce (Robertson 1929).

Present in the area are annual grasslands populated by burrowing mammals that could provide nests and prey for burrowing owls. While continuous grassland habitats are not present, such habitats are directly adjacent to the Project Area. Therefore, western burrowing owls may occur within the Project Area.

Ferruginous Hawk (*Buteo regalis*) – CSC

The ferruginous hawk is a California species of special concern (CDFG 2006b). This hawk is an uncommon winter resident and migrant in the lower elevations and open grasslands of the Central Valley and Coast Ranges; it is a fairly common resident in the Southern Californian grasslands and agricultural areas. Ferruginous hawks favor open grasslands, sagebrush flats, desert scrubs, low foothills surrounding valleys and fringes of pinyon-juniper habitats. Requiring open and treeless areas to hunt, the ferruginous hawk feeds on lagomorphs, ground squirrels, and mice, as well as birds, reptiles, and amphibians. It is speculated that the hawk's population trend follows the lagomorph population cycles. There are no records of the ferruginous hawk breeding in California, meaning any individuals would have migrated from the breeding area. Ferruginous hawks prefer to roost in open areas, usually in a lone tree or other elevated structure. Migration to California usually occurs in September, where the ferruginous hawk will remain until mid-April (Zeiner et al. 1990a).

While the Project Area is outside this species' known geographic breeding range, there is potential for this species to exist as migrant or wintering birds. This species tends to frequent open grasslands, which are present within only a small part of the expected inundation zone. Therefore, there is little potential for this species to occur near the reservoir margin.

Vaux's Swift (*Chaetura vauxi*) – CSC

The Vaux's swift is a California species of special concern (CDFG 2006b). This swift is a summer resident of northern California, preferring redwood and Douglas fir habitats. Between

April and May, and between August and September, the Vaux's swift is a fairly common migrant throughout the state. Nesting typically takes place in hollow trees in redwood, Douglas fir, and occasionally other coniferous forests, with the nest located near the bottom of the cavity. The Vaux's swift show a preference for foraging over rivers and lakes, but will forage over most terrain or habitat. They feed almost exclusively on flying insects taken in long continuous foraging flights. The Vaux's swift breeds from early May to mid-August, with a usual clutch size of four to five eggs (Zeiner et al. 1990a).

The Project Area provides suitable Douglas fir habitat for nesting Vaux's swifts and abundant aquatic foraging habitat for this species. The presence of this species was confirmed during reconnaissance-level wildlife surveys conducted by ENTRIX biologists.

Black Swift (*Cypseloides niger*) – CSC

The black swift is a California species of special concern (CDFG 2006b). This swift occurs widely throughout western North America in summer, with its breeding range extending as far north as southeastern Alaska, as far east as central Colorado, and southward through Mexico and Central America to Costa Rica, with additional populations in the West Indies (Lowther and Collins 2002). The black swift builds its nest in moist locations on sea cliffs above surf, or on cliffs behind or adjacent to waterfalls in deep canyons. The nest is constructed of mud mixed with moss, ferns, seaweed, or other plant materials. Nests are generally located in deep, dark cave crevices or under overhangs where they are usually kept moist by spray from the surf or a waterfall. Black swifts nest in colonies of a few pairs (CDFG 2006b).

Black swifts feed exclusively on flying insects, captured in sustained long-distance foraging flights, usually high in the air. Black swifts often pursue insects in updrafts associated with cliffs or storm fronts. Apparently their only regular resting-places are on steep, rocky, and often moist cliffs, such as those used for nesting (CDFG 2006b). This species forages widely over many habitats. During migration, black swifts are rare and irregular outside the breeding range; however, they do not winter in California (CDFG 2006b).

Black swifts are unlikely to breed within the Project Area. The Project Area lacks the waterfall habitat and steep canyons necessary to support this species. While there is a small possibility of black swifts occurring near the reservoir outlet (Lower Crystal Springs Dam), any habitat in this area would be anthropogenic and marginal at best. The requisite moist climates caused by waterfall or surf overspray are also absent.

Little Willow Flycatcher (*Empidonax traillii brewsteri*) – CE

The little willow flycatcher is state listed as endangered (CDFG 2006b). This subspecies occurs west of the Cascade Range and in the Sierra Nevada from southwestern California (north of the Santa Ynez River) northward to southwestern British Columbia (Sedgwick 2000). This species prefers moist shrubby areas that often include standing or running water. In California, this species is restricted to thickets of willows, along streams in broad valleys, in canyon bottoms, around mountain seepages, or at the margins of ponds and lakes (Grinnell and Miller 1944).

Occupied habitats are usually composed of dense growths of willows (*Salix* sp.), seepwillow (*Baccharis* sp.), or other shrubs and medium-sized trees. There may be an overstory of cottonwood (*Populus* sp.), tamarisk (*Tamarix* sp.), or other large trees, but this is not always the case. In some areas, the flycatcher will nest in habitats dominated by tamarisk and Russian olive (*Eleagnus angustifolia*). One of the most important characteristics of the habitat appears to be the presence of dense vegetation; usually throughout all vegetation layers present (USGS 2006).

Within the Project Area, dense willow vegetation with standing water provides the habitat preferred by the little willow flycatcher. However, the Project Area is outside the reported range of this species, and it is not likely to occur.

American Peregrine Falcon (*Falco peregrinus anatum*) – FD, CE, CFP

The American peregrine falcon is state listed as endangered (CDFG 2006b) and is a California Fully-Protected species (CDFG 2006b) (Fish and Game Code 3511). This falcon was formerly federally listed as endangered (Federal Register 1970a, 1970b), but was delisted in 1999 (Federal Register 1999). This medium sized raptor breeds from non-Arctic portions of Alaska and Canada, southward to Baja California (except on the coast of southern Alaska and in British Columbia), and locally in central Arizona and Mexico. Nesting American peregrine falcons usually winter in the breeding range, with the exception of those who breed near the northern extent of their range, which move south. The primary nesting habitat for the American peregrine falcon tends to be cliffs or series of cliffs that dominate the surrounding landscape. However, suitable nesting sites can also be found in river cutbanks, trees, and manmade structures including tall towers and the ledges of tall buildings. American peregrine falcons hunt their prey in the air, usually over open habitat types such as waterways, fields, and wetland areas, diving at speeds of up to 200 miles per hour to strike their targets. Jays, flickers, meadowlarks, pigeons, starlings, shorebirds, waterfowl, and other readily available species make up the American peregrine falcon's diet. The raptor may travel 10 to 12 miles from their nests in search of prey. Breeding takes place in later March and April, with a usual clutch size of three to four eggs (USFWS 2006).

An adult peregrine was observed feeding a juvenile within the Project area downstream from LCSD during the second breeding bird site visit in late June, 2007. The two birds perched on the I-280 Bridge, which crosses San Mateo Creek 460 feet downstream from LCSD. This bridge may provide suitable nesting sites, although no evidence of nesting was observed and the birds were not observed on the initial visit the previous week. There is no suitable nesting habitat within the expected inundation zone; however, the reservoir and associated waterfowl represent suitable foraging resources for this species.

Saltmarsh Common Yellowthroat (*Geothlypis trichas sinuosa*) – CSC

Saltmarsh common yellowthroat is a California species of special concern (CDFG 2006b). This yellowthroat is a small wren-like bird with an olive-brown back and rich yellow throat. This migratory bird ranges from Canada to southern Mexico, and winters from the southern United States to the West Indies and Panama. The subspecies is a resident of the San Francisco Bay region, inhabiting freshwater and saltwater marshes. Saltmarsh common yellowthroat requires contiguous freshwater and saltwater marsh habitats. It requires thick, continuous cover down to the water surface for foraging, as well as tall grasses, tule patches, or willows for nesting.

Within the Project Area there are small patchy localities where sufficient tule vegetation exists to support this species. Stands of dense willow habitat are also present, which can support breeding yellowthroats. The presence of breeding saltmarsh common yellowthroats was confirmed during reconnaissance-level wildlife surveys conducted by ENTRIX biologists in May 2006.

Bald Eagle (*Haliaeetus leucocephalus*) –FD, CE, CFP

The bald eagle is state listed as endangered and is a California fully protected species (CDFG 2006b). This eagle was formerly federally listed as threatened, but was delisted in 2007 (Federal Register 2007a)

The bald eagle is a permanent resident and uncommon winter migrant in California. It is now restricted to breeding mostly in Butte, Lake, Lassen, Modoc, Plumas, Shasta, Siskiyou, and Trinity counties. About half of the wintering population is in the Klamath Basin. The bald eagle is fairly common as a local winter migrant at a few favored inland waters in southern California. The largest numbers occur at Big Bear Lake, Cachuma Lake, Lake Mathews, Nacimiento Reservoir, San Antonio Reservoir, and along the Colorado River. The bald eagle is typically found in coniferous forest habitats with large old-growth trees near permanent water sources such as lakes, rivers, or ocean shorelines. It requires large bodies of water with abundant fish and adjacent snags or other perches for foraging. The bald eagle preys mainly on fish and occasionally on small mammals or birds, by swooping from a perch or from mid-flight. Nests are found in large, old growth, or dominant trees, especially ponderosa pine with an open branchwork, usually 50 to 200 feet above the ground. It breeds February through July, with peak activity from March to June. Clutch size is usually two eggs, and incubation typically lasts 34 to 36 days (Zeiner et al. 1990a).

While there is suitable habitat within the Project Area to support breeding and wintering bald eagles, this species has not been recorded breeding in the San Francisco peninsula in recent years. The nearest reported nesting location is 35 miles to the east, at Del Valle Lake in eastern Alameda County. Extensive Douglas fir stands on the western side of the reservoir could host breeding eagles, and the reservoir itself could serve as potential foraging habitat for bald eagles. Bald eagles may occur within the Project Area as wintering or migrant birds.

Loggerhead Shrike (*Lanius ludovicianus*) – CSC

The loggerhead shrike is a California species of special concern (CDFG 2006b). This shrike is a common resident and winter visitor in lowlands and foothills throughout California. It prefers open habitats with scattered shrubs, trees, posts, fences, utility lines, or other perches. The highest density of these shrikes in California occurs in open-canopied valley foothill hardwood, valley foothill hardwood-conifer, valley foothill riparian, pinyon-juniper, juniper, desert riparian, and Joshua tree habitats. The loggerhead shrike occurs only rarely in heavily urbanized areas, but is often found in open cropland. It builds its nest on a stable branch in the dense foliage of a shrub or tree, usually well-concealed. Nest height is 1 to 50 feet above ground. Egg-laying occurs from March into May, and young become independent in July or August. The loggerhead shrike is a monogamous and solitary nester with a clutch size of four to eight eggs. Incubation lasts 14 to 15 days. Altricial young are tended by both parents and leave the nest at 18 to 19 days (Zeiner et al. 1990a).

There is suitable breeding and foraging habitat within the Project Area to support this species. Substantial tracts of riparian woodland occur within the historical inundation zone. Open oak-grasslands at the southern end of the reservoir provide potential foraging opportunities. This species is expected to occur within the Project Area.

California Black Rail (*Laterallus jamaicensis coturniculus*) – CT

The California black rail is state listed as threatened, and is a California Fully-Protected species (CDFG 2006b). This rail occupies tidal and freshwater marshes in coastal California between Bodega Bay and Morro Bay, and inland at the Salton Sea and lower Colorado River. Drastic population declines have been recorded throughout its range, corresponding with the widespread loss of marsh habitat to agriculture, salt production, and urban development. It has been eliminated from coastal California south of Morro Bay (Eddleman et al. 1994). The California black rail is a year-round resident in the state, and only short migrations have been recorded between breeding and non-breeding habitats. The species is active throughout the day, and forages on small invertebrates and seeds. It occupies saltwater and freshwater marshes and sloughs, and is most abundant in tidal marshes near the high tide level (Evens et al. 1991). Access to well-vegetated upland areas for refuge during high tides may be an essential habitat component. Nesting habitat generally consists of a dense cover of pickleweed, bulrush, saltgrass, or cattails (CDFG 1992). Between three to eight eggs are laid in April and May. Juveniles are known to disperse close to 1 mile (Eddleman et al. 1994).

There is some potential for this species to occur within the Project Area. Suitable freshwater marshes occur in the Project Area, and the relative proximity to large saltwater marshes of the San Francisco Bay increases the likelihood of this species presence, though the potential is low.

Long-billed Curlew (*Numernius americanus*) – CSC

The long-billed curlew is a California species of special concern (CDFG 2006b). In California, this curlew is reported to nest on elevated interior grasslands and wet meadows, usually adjacent to lakes or marshes. Breeding long-billed curlew are typically present in northeastern California from April to September. Generally a solitary nester, the long-billed curlew may be loosely colonial in favorable habitats. Both parents incubate a mean clutch size of four eggs for 27 to 28 days. The long-billed curlew prefers to winter in large coastal estuaries, upland herbaceous areas, and croplands. In some years, large numbers of nonbreeders remain in the Central Valley. The long-billed curlew uses its characteristic long bill to probe deep into substrate, or to grab prey from mud surfaces. In inland areas, the long-billed curlew takes insects (both adults and larvae), worms, spiders, berries, crayfish, snails, and small crustaceans. Occasionally this curlew will take nestling birds. In coastal estuaries and intertidal zones, the long-billed curlew preys on mud crabs, ghost shrimp, mud shrimp, insect pupae, gem clams, and small estuarine fish (Zeiner et al. 1990a).

While the long-billed curlew primarily uses tidal estuaries as wintering habitat, it has been recorded foraging along freshwater marsh habitat. This curlew could potentially occur within the Project Area as wintering or migrant birds.

Osprey (*Pandion haliaetus*) – CSC (Nesting)

The osprey is a California species of special concern (CDFG 2006b). This raptor occurs primarily in ponderosa pine and mixed conifer habitats along seacoasts, lakes, and rivers. It preys mostly on fish at or below the water surface, but will also take small mammals, birds, reptiles, amphibians, and invertebrates. Foraging areas require large snags and open trees near large, clear, open waters. The osprey typically swoops from flight, and hovers or perches to catch prey. The osprey breeds primarily in northern California, and typically builds nests in large conifers, but may also use artificial platforms as nesting areas. The breeding season is from March to September. Nests are built on platforms of sticks at the top of large snags, dead-topped trees, on cliffs, or on human-made structures. A nest may be as much as 250 feet above ground, and is usually within 1,000 feet of fish-producing water. Osprey need tall, open-branched "pilot trees" nearby for landing before approaching the nest and for use by young for flight practice. Typically, this species migrates in October southward along the coast and the western slope of the Sierra Nevada to Central and South America (Zeiner et al. 1990a).

While nesting trees for osprey are unlikely to occur within the historical inundation zone, the potential for utilization of the reservoir as foraging habitat by this species is very high. Large Douglas fir stands on the western side of the reservoir could support breeding osprey. Due to the proximity of this habitat to the reservoir, osprey are expected to occur in the Project Area.

Double-crested Cormorant (Phalacrocorax auritus) – CSC

The double-crested cormorant is a California species of special concern (CDFG 2006b). This species is a yearlong resident along the entire coast of California and on inland lakes, typically in fresh, salt, and estuarine waters. From August to May, this cormorant is fairly common to locally very common along the coast, as well as in estuaries and salt ponds. This cormorant rests in daytime, and roosts overnight beside water on offshore rocks, islands, steep cliffs, dead tree branches, wharfs, jetties, or even transmission lines. The double-crested cormorant must visit perches periodically during the day to dry plumage, and the perching sites must be devoid of vegetation. This species sometimes rests, or even sleeps, on water in daytime. It requires either a considerable stretch of water or an elevated perch for take-off (Remsen 1978).

Double-crested cormorants feed mainly on fish, but also on crustaceans and amphibians. They dive from the waters' surface to pursue prey underwater, usually remaining submerged for about 30 seconds. These birds prefer water less than 30 feet deep with rocky or gravel bottom, but may catch fish as deep as 72 feet, occasionally feeding cooperatively in flocks of up to 600, often with pelicans (Remsen 1978). This cormorant requires undisturbed nest sites beside water, on islands or mainland for breeding success. For nesting sites, this species prefers to utilize wide rock ledges on cliffs rugged slopes, and live or dead trees, especially tall ones. (Remsen 1978).

Double-crested cormorants were observed by ENTRIX biologists during Project wildlife surveys on June 26, 2006.

Bank Swallow (*Riparia riparia*) – CT

The bank swallow is state listed as threatened (CDFG 2006b). This species arrives in California from South America in early March, and remains until early August when colonies are abandoned and migration begins. The bank swallow is found primarily in riparian and other lowland habitats in California west of the desert during the spring-through-fall period. The bank swallow is a common migrant within the interior of the state during the spring-through-fall period, and less common along the coast. There are few records of the bank swallow during the winter months for California. During the summer, the bank swallow is restricted to riparian, lacustrine, and coastal areas with vertical banks, bluffs, and cliffs with fine-textured or sandy soils. This swallow is a colonial breeder. Approximately 75 percent of the current breeding population in California nests along the banks of the Sacramento and Feather River in the northern Central Valley. The bank swallow breeds from early May through July, digging horizontal nesting tunnels and burrowing along the side of stream banks and cliffs. Most colonies contain between 100 and 200 nesting pairs. The bank swallow feeds predominantly over open riparian areas, but will also forage over brushland, grassland, wetlands, water and irrigated crop land. The bank swallows diet includes a wide variety of aerial and terrestrial soft-bodied insects, including flies, bees, and beetles (Zeiner et al. 1990a).

Along the margins of the reservoir, erosion processes have created vertical shorelines that may potentially serve as suitable nesting substrate. Horizontal burrows into such banks were observed by ENTRIX biologists, although these did not appear to be nesting sites of bank swallows.

Black Skimmer (*Rynchops niger*) – CSC

The black skimmer is state listed as threatened (CDFG 2006b). Although this species was first reported in California in 1962 on the coast of Orange County, it has become an increasingly frequent visitor to coastal estuaries and river mouths of southern California. This skimmer is also an accidental visitor at a few other interior locations, such as Lake Havasu and Palo Verde on the Colorado River, and Lakeview, Riverside County. The black skimmer has occurred for several years in north and central coastal California, in spring and summer, with records from Bodega Bay, Moss Landing, and San Francisco Bay. Breeding is expected to occur in the latter two locations in the near future (CDFG 2006b).

The black skimmer forages on small fishes and crustaceans in calm shallow waters. This skimmer often feeds and maneuvers in compact flocks. The black skimmer rarely lands on water and roosting occurs on sandy beaches or gravel bars (CDFG 2006b). This species usually nests in colonies of fewer than 200 pairs. Nesting sites are primarily on gravel bars, low islets, and sandy beaches in unvegetated sites. Eggs are laid in hollows or sand scrapes above high water. Dredging spoils and dikes along coastal waterways provide important artificial nesting sites, especially where human disturbance prevents nesting on nearby beaches (CDFG 2006b).

Due to marginal nesting habitat and the distance from the ocean, black skimmers are unlikely to occur in the Project Area on a regular basis. Skimmers may occur as rare vagrants.

Elegant Tern (*Sterna elegans*) – CSC

The elegant tern is a California species of special concern (CDFG 2006b). This species was formerly a rare and irregular post-nesting visitor to coastal California. Numbers increased during the 1950s, and large flocks now can be seen in most years off the southern coast. Although elegant terns are also seen in northern California, they rarely occur north of Marin County. These terns begin to arrive in southern coastal areas from breeding grounds in Mexico in June, becoming common by July. Most elegant terns depart by October. Preferred habitats are inshore coastal waters, bays, estuaries, and harbors. This tern rarely occurs far offshore, and never occurs inland. Breeding sites for this species are confined to Mexico and extreme southern California. The colony of 200 pairs at the southern end of San Diego Bay is the only breeding site in the United States (Zeiner et al. 1990a). At this location, the elegant tern nests on dikes between salt ponds in association with Caspian terns. Elsewhere, elegant terns nest in colonies on undisturbed island beaches. The nest is a usually a shallow scrape in sand about 60 feet from the surf line (Remsen 1978).

Elegant terns primarily feed in shallow ocean waters beyond the turbulent breaker zone, but also may forage in protected bays and lagoons. They dive into water for fish, their primary prey. This species congregates on beaches and tidal flats when not feeding, tending to roost high up on beaches (Remsen 1978).

Due to this species' strict preference for marine and brackish water habitats, this species is unlikely to be found within the Project Area.

Pallid Bat (*Antrozous pallidus*) - CSC

The pallid bat (Antrozous pallidus) is a California species of special concern (CDFG 2006b). This species ranges from western Canada to central Mexico and is widely distributed at lower elevations in California (Zeiner, et al. 1990b). The pallid bat utilizes a variety of habitats, including grasslands, shrublands, woodlands, and forests, although it is commonest in open habitats with rocky areas for roosting. This bat seems to prefer to forage in the open. The pallid bat utilizes three different types of roosts. The day roost is usually in a warm, horizontal opening such as in attics or rock cracks; the night roost is usually in the open, near foliage; and the hibernation roost, which is often in buildings, caves, or cracks in rocks (Miller 2002).

Pallid bats are likely to occur within the Project Area. Although the Project Area lacks the granite and rocky exposures necessary for roosting, anthropogenic structures within the Project Area may serve as suitable roosting sites. Insects associated with grasslands and aquatic habitats within the Project Area provide foraging resources for this species.

Pacific Western Big-eared Bat (*Corynorhuinus [= Plecotus] townsendii townsendii*) – CSC

Pacific western big-eared bat is a California species of special concern (CDFG 2006b). This bat occurs throughout California, although details of its distribution are scanty. This bat occupies the humid coastal regions of northern and central California, living in a variety of conditions that include coastal conifer and broad-leaf forests, oak and conifer woodlands, arid grasslands and deserts, and high-elevation forests and meadows. Throughout most of its geographic range, this bat is most common in mesic sites. Known roosting sites in California include limestone caves and lava tubes, though the species will also use mine tunnels, buildings, and other human-made structures. Habitat must include appropriate roosting, maternity, and hibernacula sites free from disturbances by humans. A single visit by humans can cause the bats to abandon a roost. Females typically roost in large maternity colonies, which are highly susceptible to disturbance. Males usually roost singly or in small groups, and are probably not affected as much as females by disturbances. Both sexes hibernate in buildings, caves, and mine tunnels, either singly (males) or in small groups (Williams 1986).

The Project Area offers suitable habitat for this species due to its habitat preference of coastal woodlands and its avoidance of human activities. Anthropogenic structures within the Project Area may provide roosting opportunities, and the variety of mixed hardwood forests and oak woodlands provide foraging habitat. This species is likely to occur within the Project Area.

Greater Western Mastiff Bat (*Eumops perotis californicus*) – CSC

The greater western mastiff bat is a California species of special concern (CDFG 2006b). This bat occurs from central California southward to central Mexico. In California, it has been recorded from Butte County southward in the western lowlands through the southern California coastal basins and the western portions of the southeastern desert region. Mastiff bats have been observed at Hetch Hetchy Reservoir in the central Sierra Nevada. All others reports are from lower-lying regions. This species is resident within the state, although some bats probably migrate from the colder areas to winter in the southern lowlands (Williams 1986).

Mastiff bats appear to favor rugged, rocky areas where suitable crevices are available for day-roosts. Characteristically, day-roosts are located in large cracks in exfoliating slabs of granite or sandstone. The crevices must open downward, must be at least 2 inches wide and 12 inches deep, and must narrow to approximately 1 inch at the upper end. The crevices typically open high on a cliff and are at least 6 feet above the substrate. Mastiff bats have great difficulty taking flight, and must drop at least 6 to 10 feet for launching. Mastiff bats also frequently roost in buildings, provided these have sheltering spaces with conditions similar to those described above (Williams 1986).

Mastiff bats have been estimated to forage as much as 2000 feet above the ground, often regularly foraging at 100 to 200 feet over the substrate. They probably forage for considerable distances from their roosting sites. For example, colonies roosting in suitable sites in the Diablo and Temblor ranges, flanking the San Joaquin Valley, likely foraged over the valley floor where insects were more abundant. Extensive loss of habitat due to urbanization of coastal basins, marsh drainage, and cultivation of major foraging areas are likely factors in their decline. Widespread use of insecticides has likely reduced insect abundance and also possibly poisoned some bats (Williams 1986).

Mastiff bats are likely to occur within the Project Area. Although the Project Area lacks the granite and rocky exposures necessary for roosting, anthropogenic structures within the Project Area may serve as suitable roosting sites. Insects associated with grasslands and aquatic habitats within the Project Area provide foraging resources for this species.

San Francisco Dusky-footed Woodrat (*Neotoma fuscipes annectens*) – CSC

San Francisco dusky-footed woodrat is a California species of special concern (CDFG 2006b). This subspecies is found on the San Francisco Peninsula southward to Santa Cruz County, and in the East Bay hills as well. It is a medium-sized native rodent. Dusky-footed woodrats are widespread in chaparral, woodland, and forest habitats with well-developed undergrowth, where their conical stick houses are often visible (Carraway and Verts 1991). These houses may be as much as 6 feet tall, and contain multiple chambers used for sleeping and food storage. Houses are usually occupied by single adults or females with young, and can be used by successive generations of woodrats. Woodrat houses provide cover for many other animal species, including small mammals, reptiles, amphibians, and arthropods – thus increasing local biodiversity (Cranford 1982, Vestal 1938). Woodrats feed primarily on foliage of evergreen broadleaf plants, such as oaks, coffeeberry (*Rhamnus californica*), Mexican elderberry, toyon, and gooseberry (*Ribes* spp.) (Atsatt and Ingram 1983). Reproduction occurs from February through September.

Suitable habitat for the San Francisco dusky-footed woodrat is present in the Project Area. A woodrat nest was observed during the reconnaissance-level wildlife survey conducted by ENTRIX biologists in May 2006.

Big Free-tailed Bat (*Nyctinomops macrotis*) – CSC

The big free-tailed bat is a California species of special concern (CDFG 2006b). Big free-tailed bats are found from northern South America and the Caribbean Islands northward to the western United States. Populations in the southwestern United States appear to be widely scattered. Known breeding localities in the United States are found in parts of Arizona, New Mexico, and Texas. In California, big free-tailed bats are known to exist in only a few low-lying arid areas of southern California and a single specimen from Berkeley in Alameda County. There are records of accidental occurrence (stray, migratory individuals) in widely scattered localities in western North America, including British Columbia and Iowa (Williams 1986).

Very little is known about the distribution of the big free-tailed bat in California. This species may not occur regularly within the state. The records, however, do suggest that big free-tailed bats breed somewhere within the state. The most likely breeding location is in the rugged, wooded and mountainous areas of southern California. At least one of the specimens from California was a young bat collected on August 11. Two big free-tailed bats from San Diego have been recorded, one collected on February 1; the second, when found, was mummified. The specimen from Berkeley was collected on December 18 (Williams 1986).

Big free-tailed bats in other states are found in rugged and rocky terrain. This bat ranges up to elevations of 8,000 feet in New Mexico, southern Arizona, and Texas. This species is probably a yearlong resident. Many individuals wander widely in autumn, however, resulting in records far outside of the normal range. This bat feeds principally on large moths, but it takes a variety of other flying insects as well. Big free-tailed bats often forage over water sources. They typically roost in crevices in high cliffs or rock outcrops. These bats probably do not breed in California. In other states, small nursery colonies are formed in rocky crevices in high cliffs. Female bats bear a single offspring each year, in June and July, with births peaking in late June. The young are capable of flight in August to mid-September (CDFG 2006d).

While the Project Area includes suitable foraging habitat, it occurs outside of the known geographic range for big free-tailed bats. This species is unlikely to occur in the Project Area.

American Badger (*Taxidea taxus*) – CSC

The American badger is a California species of special concern (CDFG 2006b). This badger is an uncommon but permanent resident found throughout most of the state. The badger is active throughout the year in most of its range in California, except in the North Coast area where it enters variable periods of torpor in winter. This species is both nocturnal and diurnal, and frequents drier open stages of most shrub, forest, and herbaceous habitats. Badgers dig burrows in friable soil for cover. They frequently reuse old burrows, although some may dig a new den each night, especially in summer. Home range estimates vary geographically and seasonally. Ranges recorded in other western states varied from 338 to 1,549 acres, with the males usually occupying the larger territories. Badgers mate in summer and early fall with young born mostly in March and April in burrows that are usually found in areas with sparse overstory cover (CDFG 2006c).

Badgers eat fossorial rodents including rats, mice, chipmunks, and especially ground squirrels and pocket gophers. They also eat some reptiles, insects, earthworms, eggs, birds, and carrion. Diet shifts seasonally and yearly in response to availability of prey (CDFG 2006c).

While there is little semi-arid open habitat in the Project Area, adjacent large tracts of undisturbed land provide ample food resources and area for large home ranges. The nearest recorded occurrence for this species is 1.7 miles northwest. There is a moderate potential for American badgers to occur within the Project Area. Habitat for the American badger is present in the Project Area, although neither badgers nor their burrows were observed during the 2006 reconnaissance surveys.

4.3 Special-Status Aquatic Wildlife Species

Six special-status aquatic species, listed in Table 4-4, are potentially present in the Project Area. Two of these species, the Central California Coastal steelhead (*Oncorhynchus mykiss*) Evolutionarily Significant Unit (CCC-ESU) and the California red-legged frog (*Rana aurora draytonii*), are federally listed as threatened. For one species, western pond turtle (*Clemmys marmorata),* either of the two subspecies may be present.

Table 4-4: Special-status Aquatic Wildlife Species with Potential to Occur in the Lower Crystal Springs Dam Improvement Project Area

COMMON NAME SCIENTIFIC NAME	STATUS	COMMON NAME SCIENTIFIC NAME	STATUS
Invertebrates			
Ricksecker's water scavenger beetle *Hydrochara rickseckeri*	State special animal	San Francisco forktail damselfly *Ischnura gemina*	State special animal
Fish			
Steelhead *Oncorhynchus mykiss*	FT		
Amphibians			
California red-legged frog *Rana aurora draytonii*	FT, CSC	Foothill yellow-legged frog *Rana boylii*	CSC
Reptiles			
Northwestern pond turtle *Clemmys marmorata marmorata*	CSC	Southwestern pond turtle *Clemmys marmorata pallida*	CSC

4.3.1 Federally-Listed Aquatic Wildlife Species

Two federally listed aquatic species potentially occurs in the Project Area. The central California coastal steelhead (*Oncorhynchus mykiss*) and the California red-legged frog (*Rana aurora draytonii*) are both designated as Threatened.

Central California Coastal Steelhead ESU - (*Oncorhynchus mykiss*) – FT

The anadromous form of *Oncorhynchus mykiss* is commonly called steelhead. The Central California Coastal Evolutionarily Significant Unit (ESU) is federally-listed as threatened (Federal Register 2005b, 2006a). Steelhead in this area of the coast and from San Francisco Bay tributaries, including San Mateo Creek are included in the Central California Evolutionarily Significant Unit (ESU) (Federal Register 2005b). Critical habitat has been designated for the Central California Coastal ESU, but San Mateo Creek, which is part of the San Mateo Bayside watershed, is not included in this designation (Federal Register 2005b, 2006a).

Steelhead have a very flexible life history. All steelhead hatch in the gravel-cobble substrate of coldwater streams during the winter spawning period (February through April). Fertilized eggs hatch in about four weeks. Young fish do not immediately leave the gravel and emerge into the river after two to three weeks as fry to begin to feed in the stream. Some begin to disperse downstream in the months following emergence but most continue to rear in the stream for a period of up to a two years before migrating to the bay and eventually the ocean to grow to adults.

Steelhead that migrate to the ocean undergo physiological changes in the process of smoltification that allow them to adapt to seawater. Steelhead, spend a variable amount of time in the ocean, typically one to two years, grow rapidly and return to spawn, generally in the stream where they hatched (Shapovalov and Taft 1954). Steelhead are unusual among the Pacific salmonids in that they do not necessarily die after spawning. Post-spawned steelhead known as kelts, return to the ocean after a brief period in freshwater (Barnhart 1986). Some variable fraction of rainbow trout within any given stream choose to remain in freshwater even when the ocean is readily available to them. These fish can reach sexual maturity and spawn without ever entering the ocean and are described as resident rainbow trout. There are a number of documented life history strategies that are intermediate between resident populations and fully anadromous populations.

In California, many streams support both resident and anadromous forms with no observable genetic differentiation. During extended drought periods, it is possible for populations to sustain themselves through resident spawning and then revert to anadromy when suitable conditions return. Presence of resident rainbow trout populations tends to increase in the southern part of the North American range (Cramer et al. 1995). Rainbow trout observed in freshwater habitat may be the offspring of either anadromous or resident fish; it is not possible to distinguish them based on external characteristics. For simplicity, *Oncorhynchus mykiss* are referred to as steelhead in this document unless the life history is known to be non-anadromous.

There have not been any studies conducted on steelhead juveniles or adults in lower San Mateo Creek system, but migration periods are probably similar to those of other streams that are tributary to San Francisco Bay.

Temperature influences both the survival and development of steelhead embryos. Northern steelhead stocks have been reported to spawn at temperatures of 3.9º C (39º F) to 9.4º C (49º F), although normal development of steelhead embryos is reported to occur between 7.0º C (45º F) and 12.0º C (54º F) (Hagar 1996, Bjorn and Reiser 1991, Bell 1981). These temperatures, however, may be inappropriate for use with more southern stocks, but no temperature suitability data are available for the southern stocks. Steelhead spawn in cool, clear, well-oxygenated streams with suitable depth, current velocity, and gravel size (Reiser and Björnn 1979). Data collected above steelhead redds reported steelhead spawning at water depths of 0.1 to 1.5 meters and flows of 23 to 155 cubic feet per second (cfs), and in gravel 0.6 to 12.7 centimeters in diameter (Smith 1974, Bovee, 1978, Wesche and Rechard 1980). Steelhead usually spawn in the tail of pools or in riffles with gravel substrate (Moyle 2002). The female digs a pit in the gravel where she deposits her eggs. Often more than one male will fertilize the eggs before the female covers the eggs with gravel, creating a redd (Moyle 2002). Females often deposit only a fraction of their eggs in a given redd, moving to a nearby area and repeating the process until all eggs are deposited. The eggs and newly-hatched fry (alevins) buried in the gravel require a constant flow of water through the gravel to provide dissolved oxygen and to carry away metabolic waste products. This water exchange is a function of stream gradient and substrate composition. If fine sediments accumulate within or over the redd, they can interfere with water exchange and adversely affect eggs and alevins, even resulting in mortality at times (Björnn and Reiser 1991).

Steelhead alevins emerge from the gravel in approximately five to eight weeks after the eggs have been deposited, between March and May, depending on water temperature, dissolved oxygen concentration, and substrate composition (Shapovalov and Taft 1954, Moyle 2002). In water temperatures around 15.6° C (60° F), steelhead can emerge within three weeks (Barnhardt 1991).

Steelhead fry and juveniles feed on a variety of invertebrates including aquatic and terrestrial insects, amphipods, and snails (Moyle 2002). After emergence, steelhead fry (often in small schools) frequently inhabit shallow water along stream margins. As the fry grow larger, the schools disburse and individuals establish territories. Young-of-the-year steelhead often utilize riffle and run habitat during the growing season and move to deeper, slower water habitat during the winter season (Baltz and Moyle 1984). Larger juvenile steelhead, usually yearlings or older, often use heads of pools for feeding stations (Baltz and Moyle 1984). Pools provide over-summer refugia for trout in small streams during low-flow conditions.

A daily average temperature of 20° C (68° F) or lower has been used in central and southern California by CDFG to describe suitable thermal conditions for steelhead. This temperature represents a level below which reasonable growth of rainbow trout may be expected. In general, rainbow trout/steelhead in warmer water require more food and oxygen because their metabolism increases with temperature (Brett 1971, Fausch 1984).

The historical range of steelhead occurred throughout the north Pacific Ocean from the Kamchatka Peninsula in Asia to the northern Baja Peninsula (Federal Register 1996c). Steelhead likely inhabited most coastal and inland streams in Washington, Oregon and California as well as many inland streams in Idaho. The current range of steelhead extends from the Kamchatka Peninsula south to at least Malibu Creek in southern California, although significant population declines have occurred in recent decades (Nehlsen et al. 1991). Several factors are thought to have caused these declines. For instance, degradation and loss of over 90 percent of wetland and riparian habitats have been major sources of decline of steelhead in California. Additionally, habitat losses have occurred as a result of water diversions for agriculture, flood control and hydroelectric power, sedimentation from adjacent land use activities, and urbanization (Federal Register 1996c). Recreational fishing and the introduction of non-native predator species have also contributed to the decline.

The upstream and downstream populations of *Oncorhynchus mykiss* in San Mateo Creek were separated when Crystal Springs Reservoir was constructed in 1877. Collections of this species were made from San Mateo Creek prior to 1860. Sampling in 1988, 1991, and 1993 located individuals of this species both upstream and downstream from Crystal Springs Reservoir (Leidy et al. 2005). NOAA Fisheries considers individuals of this species in San Mateo Creek below the Lower Crystal Springs Dam to be steelhead (SFPUC 2006).

Additional information on fish habitat in San Mateo Creek both upstream from Lower Crystal Springs Reservoir and downstream from Lower Crystal Springs Dam is provided in a separate report (ENTRIX 2008).

Critical Habitat

Critical habitat has been designated for the Central California Coastal ESU, but San Mateo Creek, which is part of the San Mateo Bayside watershed, is not included in this designation (Federal Register 2005b, 2006a).

California Red-legged Frog - (*Rana aurora draytonii*) -FT

The California red-legged frog (Rana aurora draytonii) is federally listed as threatened (Federal Register 1996a), and is a California species of special concern (CDFG 2006b). The USFWS released a recovery plan in 2002 (USFWS 2002b). Critical habitat for the California red-legged frog was designated in 2001 (Federal Register 1996a). However, on November 6, 2002, the U.S. District Court for the District of Columbia entered into a consent decree, vacating the critical habitat designation (except Units 5 and 31), and remanding the designation to the USFWS to conduct an economic analysis. Critical habitat was again designated on April 13, 2006 (Federal Register 2006c). Upper Crystal Springs Reservoir is not designated as critical habitat for the California red-legged frog, but Lower Crystal Springs Reservoir is in Critical Habitat Unit SNM-1A.

Historically, the California red-legged frog occurred in coastal mountains from Marin County southward to northern Baja, California, and along the floor and foothills of the Central Valley from about Shasta County southward to Kern County (Jennings et al. 1992). Currently, this subspecies generally only occurs in the coastal portions of its historic range; it has been apparently extirpated from the valley and foothills and in most of southern California south of Ventura County. California red-legged frogs are usually confined to aquatic habitats such as creeks, streams and ponds), and occur primarily in areas having pools approximately 3 feet deep, with adjacent dense emergent or riparian vegetation (Jennings and Hayes 1988). Adult frogs move seasonally between their egg-laying sites and foraging habitat, but generally they rarely move large distances from their aquatic habitat. California red-legged frogs breed from November to March. Egg masses are attached to emergent vegetation (Jennings and Hayes 1994), and hatch within 14 days. Metamorphosis generally occurs between July and September.

The California red-legged frog is a large frog found in habitats characterized by dense, shrubby, riparian vegetation associated with deep (0.7 meter), still, or slow-moving water (Jennings 1988, Jennings and Hayes 1988). Emergent vegetation is important for cover as well as for egg attachment (Storer 1925).

The presence of California red-legged frogs has been documented within the Crystal Springs watershed (CDFG 2005; CDFG 2006c; McGinnis 1998; Swaim Biological 2003, 2004, 2005; Kossack –n.d.). Their presence was also confirmed from an incidental observation during reconnaissance-level wildlife surveys on June 26, 2006.

During the 2006 survey period, multiple observations of CRLF in various life stages (egg masses, larvae, recent metamorph and adult) were made (Table 4-5, Appendix D figure). Of the 36 individual egg masses identified, eight were found stranded on dry land, most likely the result of receding water level. On February 6, six of the stranded egg masses were moved approximately 10 m into the water on the northeast shore of LCSR. Ten days later a subsequent visit was made. The water level had dropped significantly and the egg masses were once again stranded on shore. The eggs were completely desiccated and no attempted was made to move them again. The two other egg masses found on dry land were within 5 cm of water in mud and were left as they were found. One CRLF egg mass and three adults were observed in Caltrans sediment basin #5. One adult CRLF was observed in basin #4. No CRLF of any life stage was observed in any of the other sediment basins. The pool at the top of the dam at LCSR contained 12 visible CRLF egg masses in 2006. One tadpole was also observed (dip netting and seining were not conducted at the dam pool due to safety reasons). Two CRLF egg masses were seen at an un-named sediment basin at the northwest corner of Canada Road and Edgewood Road, 3 km south of UCSR. This area was not surveyed again in 2007, but breeding is assumed there.

In 2007 ninety-three egg masses were located (see section 3.1.1.1 for a more detailed description of egg masses).

It should be noted that due to varying levels of search effort temporal and spatial differences in numbers of frogs detected should not be interpreted as actual differences in frog density or habitat preferences.

Ninety-three CRLF egg masses were found during the 2007 breeding season. (Table 4-5). Of these, 47 were in LCS, 32 were in UCS, 13 were in TDP, and one was in Tracy Lake.

Six egg masses were relocated due to the threat of desiccation from being stranded on land due to falling water levels. Relocations were the minimum distance to deeper water.

Table 4-5: Results for California Red-Legged Frog (CRLF) Surveys in the Project Area

Observation Date	Age Class	Condition	Wetland[1]
2/14/2006	E	Healthy - in water	Basin 5
2/14/2006	A	Alive	Basin 5
2/14/2006	A	Alive	Basin 5
2/14/2006	A	Alive	Basin 5
in 1997	A	Alive	Basin 4
2/1/2006	E	Healthy - in water	Dam
7/6/2006	L	Alive	Dam
12/29/2006	A	Alive	Dam
1/22/2007	E	Healthy - in water	Dam

Table 4-5: Results for California Red-Legged Frog (CRLF) Surveys in the Project Area

Observation Date	Age Class	Condition	Wetland[1]
3/21/2007	E	Healthy - in water	Below Dam
2/15/2006	E	Healthy - in water	EDGEWD
2/15/2006	E	Healthy - in water	EDGEWD
3/1/2006	E	Out of water	WET1
4/11/2006	L	Alive	WET1
7/5/2006	J	Alive	WET1
7/5/2006	J	Alive	WET1
7/5/2006	L	Alive	WET1
3/13/2007	A	Alive	WET1
3/13/2007	E	Healthy - in water	WET1
3/13/2007	E	Healthy - in water	WET1
8/22/2006	J	Alive	WET100
8/22/2006	J	Alive	WET100
8/22/2006	J	Alive	WET100
2/27/2007	E	Healthy - in water	WET100
2/27/2007	E	Healthy - in water	WET100
3/15/2007	E	Healthy - in water	WET100
3/15/2007	E	Healthy - in water	WET100
2/14/2006	J	Alive	WET102
2/24/2006	E	Healthy - in water	WET102
8/18/2006	J	Alive	WET102
8/18/2006	J	Alive	WET102
8/18/2006	J	Alive	WET102
8/21/2006	J	Alive	WET102
8/21/2006	J	Alive	WET102
8/21/2006	J	Alive	WET102
2/9/2007	A	Injured	WET102
2/15/2007	E	Healthy - in water	WET102
2/15/2007	E	Healthy - in water	WET102
2/15/2007	E	Healthy - in water	WET102
2/15/2007	E	Healthy - in water	WET102
8/14/2006	J	Alive	WET104
3/15/2007	E	Healthy - in water	WET104
3/15/2007	E	Healthy - in water	WET104
3/15/2007	E	Healthy - in water	WET104
1/8/2007	A	Alive	WET173
2/3/2006	E	Healthy - in water	WET2
2/6/2006	E	Out of water	WET2
2/6/2006	E	Out of water	WET2
2/6/2006	E	Healthy - in water	WET2
2/6/2006	E	Out of water	WET2

Table 4-5: Results for California Red-Legged Frog (CRLF) Surveys in the Project Area

Observation Date	Age Class	Condition	Wetland[1]
2/6/2006	E	Out of water	WET2
2/6/2006	E	Out of water	WET2
2/7/2006	E	Out of water	WET2
2/7/2006	A	Dead	WET2
2/8/2006	E	Healthy - in water	WET2
2/16/2006	E	Healthy - in water	WET2
3/1/2006	A	Dead	WET2
3/1/2006	E	Out of water	WET2
3/1/2006	E	Out of water	WET2
7/5/2006	L	Alive	WET2
7/13/2006	J	Alive	WET2
7/13/2006	J	Alive	WET2
7/13/2006	J	Alive	WET2
1/5/2007	A	Dead	WET2
1/22/2007	E	Out of water	WET2
2/1/2007	A	Dead	WET2
2/8/2007	E	Healthy - in water	WET2
2/8/2007	E	Out of water	WET2
2/8/2007	E	Out of water	WET2
2/8/2007	E	Out of water	WET2
2/8/2007	E	Out of water	WET2
2/28/2007	E	Healthy - in water	WET2
2/28/2007	E	Healthy - in water	WET2
3/2/2007	E	Healthy - in water	WET2
3/2/2007	E	Healthy - in water	WET2
3/2/2007	E	Healthy - in water	WET2
3/2/2007	E	Healthy - in water	WET2
3/2/2007	E	Healthy - in water	WET2
3/2/2007	E	Healthy - in water	WET2
3/2/2007	E	Healthy - in water	WET2
3/2/2007	E	Healthy - in water	WET2
3/2/2007	E	Healthy - in water	WET2
3/2/2007	E	Healthy - in water	WET2
3/2/2007	E	Healthy - in water	WET2
3/2/2007	E	Out of water	WET2
7/13/2006	J	Alive	WET3
1/29/2007	E	Healthy - in water	WET33
1/29/2007	E	Healthy - in water	WET33
1/29/2007	E	Healthy - in water	WET33
1/29/2007	E	Out of water	WET33
1/29/2007	E	Out of water	WET33

Table 4-5: Results for California Red-Legged Frog (CRLF) Surveys in the Project Area

Observation Date	Age Class	Condition	Wetland[1]
1/29/2007	E	Out of water	WET33
2/8/2006	E	Healthy - in water	WET5
2/8/2006	E	Out of water	WET5
2/8/2006	E	Healthy - in water	WET5
2/8/2006	E	Healthy - in water	WET5
7/13/2006	J	Alive	WET5
1/23/2007	E	Healthy - in water	WET5
1/29/2007	A	Dead	WET5
3/2/2007	A	Alive	WET5
2/13/2006	E	Healthy - in water	WET64
2/13/2006	E	Healthy - in water	WET65
3/6/2006	A	Alive	WET65
3/5/2007	E	Healthy - in water	WET65
8/18/2006	A	Alive	WET88
8/25/2006	J	Alive	WET93
		Alive	1 KM SE of San Andreas Lake
		Alive	Laguna Creek
		Alive	Laguna Creek
		Alive	Laguna Creek
		Alive	Laguna Creek
		Alive	Laguna Creek
5/15/2001	L	Alive	LCS-Dam
	E	Alive	LCS-Dam
		Alive	SFPUC Peninsula Watershed - Lower Crystal Springs
		Alive	SFPUC Peninsula Watershed - Lower Crystal Springs
		Alive	SFPUC Peninsula Watershed - Lower Crystal Springs
		Alive	SFPUC Peninsula Watershed - Lower Crystal Springs
		Alive	SFPUC Peninsula Watershed - Lower Crystal Springs
	A	Alive	SFPUC Peninsula Watershed - Lower Crystal Springs
	A	Alive	SFPUC Peninsula Watershed - Lower Crystal Springs
	A	Alive	SFPUC Peninsula Watershed - Lower Crystal Springs
	A	Alive	SFPUC Peninsula Watershed - Lower Crystal Springs
	A	Alive	SFPUC Peninsula Watershed - Lower Crystal Springs

Table 4-5: Results for California Red-Legged Frog (CRLF) Surveys in the Project Area

Observation Date	Age Class	Condition	Wetland[1]
5/30/2004	A	Alive	Mud Dam 1
6/23/2004	A	Alive	Mud Dam 1
6/27/2004	A	Alive	Mud Dam 1
7/8/2004	A	Alive	Mud Dam 1
7/16/2004	A	Alive	Mud Dam 1
7/16/2004	A	Alive	Mud Dam 1
7/16/2004	A	Alive	Mud Dam 1
7/19/2004	A	Alive	Mud Dam 1
7/19/2004	A	Alive	Mud Dam 1
7/29/2005		Alive	Mud Dam 1
8/3/2005		Alive	Mud Dam 1
		Alive	Mud Dam 2
		Alive	Mud Dam 2
		Alive	Mud Dam 2
		Alive	Mud Dam 2
		Alive	San Andreas Lake
2/2/2007	E	Alive	San Andreas Sag Pond
5/27/2004	A	Alive	Skyline Quarry
5/29/2004	A	Alive	Skyline Quarry
11/17/2004	A	Alive	Skyline Quarry
7/28/2005	A	Alive	Skyline Quarry
7/28/2005	A	Alive	Skyline Quarry
3/2/1991	A	Alive	Stone Dam
		Alive	Stone Dam
		Alive	Stone Dam
		Alive	Stone Dam
		Alive	Stone Dam
		Alive	Stone Dam
		Alive	Tracy Lake (Training SFPUC biologists)
		Alive	Tracy Lake
		Alive	Tracy Lake

[1] see map in appendix d for location code sites

Critical Habitat

Critical habitat for the California red-legged frog was designated in 2001 (Federal Register 1996a). However, on November 6, 2002, the U.S. District Court for the District of Columbia entered into a consent decree, vacating the critical habitat designation (except Units 5 and 31), and remanding the designation to the USFWS to conduct an economic analysis. Critical habitat was again designated on April 13, 2006 (Federal Register 2006c). USFWS issued another proposed revision of criticah habitat for the California red-legged frog on September 16, 2008 (Federal Register 2008). Upper Crystal Springs Reservoir is not currently designated as critical habitat for the California red-legged frog, but Lower Crystal Springs Reservoir is in Critical Habitat Unit SNM-1A. All of the project area, except for Upper and Lower Crystal Springs Reservoirs, are in Critical Habitat Unit SNM-1A in the proposed revision (Federal Register 2008).

4.3.2 Other Special-status Aquatic Wildlife Species

Four other special-status aquatic wildlife species that are not federally listed or proposed for listing potentially occur in the Project Area. These species include Ricksecker's water scavenger beetle (*Hydrochara rickseckeri*), San Francisco forktail damselfly (*Ischnura gemina*), foothill yellow-legged frog (*Rana boylii*), and western pond turtle (*Clemmys marmorata*). For western pond turtle, either of the two subspecies may be present *Clemmys marmorata marmorata* and *Clemmys marmorata pallida.*

Ricksecker's Water Scavenger Beetle (*Hydrochara rickseckeri*)

Ricksecker's water scavenger beetle is a state special animal (CDFG 2006d). This aquatic species has been reported in the San Francisco Bay area. At one time, this beetle was thought to be limited to the Bay Area, but it has recently been collected in the Central Valley (CDFG 2006d). Ricksecker's water scavenger beetle is an aquatic beetle that lives in shallow water in vernal pools and seasonal wetlands. It may also occupy similar habitats such as fresh water seeps, springs, and slow moving streams. Members of the family Hydrophilidae to which this beetle belongs are scavengers, and the aquatic larvae are predaceous (CDFG 2006d). No specific life history data are available for this beetle.

Ricksecker's water scavenger beetle was collected in the vicinity of the Pulgas Water Temple according to a 1954 report (CDFG 2006). Surveys for this beetle in the Bay Area in 1988 were unsuccessful in locating any individuals.

Shallow-water areas of Upper and Lower Crystal Springs Reservoirs, such as the Tracy Lake area, may provide habitat for Ricksecker's water scavenger beetle.

San Francisco Forktail Damselfly (*Ischnura gemina*)

San Francisco forktail damselfly (*Ischnura gemina)* is a state special animal. This species occupies small, marshy ponds and ditches with emergent and floating aquatic vegetation in San Francisco Bay area (CDFG 2006d).

Limited habitat for the San Francisco forktail damselfly may be available at Tracy Lake and possibly in other shallow, ponded areas along the shoreline of the reservoirs.

Foothill Yellow-legged Frog

The foothill yellow-legged frog (*Rana boylii*) is a California species of special concern (CDFG 2006b). This species inhabits foothill and mountain streams from sea level to about 6,000 feet elevation in the Coast Ranges from the Oregon border southward to the Transverse Mountains in Los Angeles County, in most of northern California west of the Cascade crest, and along the western flank of the Sierra southward to Kern County. Most records are below 3,500 feet. The foothill yellow-legged frog is found in a variety of habitats, including valley-foothill hardwood, valley-foothill hardwood-conifer, valley-foothill riparian, ponderosa pine, mixed conifer, coastal scrub, mixed chaparral, and wet meadow types (Zeiner et al. 1988). Foothill yellow-legged frogs were historically present in the stream between San Andreas Lake and Tracy Lake and in tributaries to Laguna Creek (CAS, MVZ).

Home ranges are small, but these frogs may move several hundred yards to spawning habitat. Adult frogs congregate at suitable spawning sites as spring runoff declines when water temperatures reach 12° to 15° C (usually any time from mid-March to May, depending on local water conditions. The breeding season at any locality is usually about two weeks for most populations. Spawning frogs favor low to moderately steep gradient streams (0 to 8 degrees). Females deposit eggs in shallow edgewater areas with water velocities less than 4 inches per second (Seltenrich and Pool 2002). Egg masses are often attached to the downstream sides of cobbles and boulders, or to gravel, wood, or other materials. Eggs hatch in approximately five days. Tadpoles transform in three to four months, and stay for a time in spawning habitat, but eventually disperse. They feed on diatoms or algae on the surface of the substrate (Stebbins 1951). Tadpoles favor calm, shallow water. Juvenile and adult frogs bask on midstream boulders or in terrestrial sites along riffles, cascades, main channel pools, and plunge-pools, often in dappled sunlight near low overhanging vegetation. They are relatively strong swimmers, and prefer faster water habitat than do other foothill frog species such as the exotic bullfrog (*Rana catesbeiana*) or the California red-legged frog.

The area between San Andreas Lake and Tracy Lake no longer provides suitable habitat as it is sediment filled, lacks any cobble or suitable substrate and its flow is regulated due to the dam at San Andreas Lake. The same is true of the creek channel of Laguna Creek in the inundation zone as it enters Upper Crystal Springs Reservoir. Small areas of marginal habitat with suitable cobble substrate for foothill yellow-legged frog remain in Upper San Mateo Creek. This area was surveyed extensively for CRLF visually and by trapping (Swaim Biological 2005 and 2007) with no observations of FYLF. Other small tributaries that occur within the Project Area highly seasonal and completely dried down between wildlife surveys conducted on May 4 and June 26, 2006. They are not expected to provide suitable habitat... Therefore this species is not expected to occur in the Project Area.

Western Pond Turtle (*Clemmys marmorata marmorata* and *Clemmys marmorata pallida*) – CSC

Western pond turtle is a California species of special concern (CDFG 2006b). Historically, this turtle had a relatively continuous distribution in most Pacific slope drainages from Klickitat County, Washington, along the Columbia River to Arroyo Santo Domingo, northern Baja California, Mexico. The known elevational range of the western pond turtle extends from near sea level to about 4,690 feet. In California, it was historically present in most Pacific slope drainages between the Oregon and Mexican borders (Jennings and Hayes 1994).

This aquatic turtle usually leaves the aquatic site to reproduce, aestivate, and overwinter. Recent fieldwork has demonstrated that western pond turtles may overwinter on land or in water, or may remain active in water during the winter season (Jennings and Hayes 1994).

Western pond turtles require some slack- or slow-water aquatic habitat. Pond turtles are uncommon in high gradient streams probably because their local distribution may be limited by water temperatures, current velocity, food resources, or any combination thereof. Habitat quality seems to vary with the availability of aerial and aquatic basking sites; however, western pond turtles often reach higher densities where many aerial and aquatic basking sites are available. Hatchlings require shallow water habitat with relatively dense submergent or short emergent vegetation in which to forage. Western pond turtles also require an upland oviposition site in the vicinity of the aquatic site. Suitable oviposition sites must have the proper thermal and hydraulic environment for incubation of the eggs. The thin shelled eggs of these turtles are suited to development in a dry nest; in an excessively moist nest (irrigated areas), eggs have a high probability of failing. Nests are typically dug in a substrate with a high clay or silt fraction, since the female moistens the site to be excavated. Nests also are typically located on a slope that is unshaded to ensure that substrate temperatures will be high enough to incubate the eggs. Nesting sites can be up to 1,320 feet from the aquatic site, but the majority of nests located to date are within 660 feet (Jennings and Hayes 1994).

Mating, which has been rarely observed, typically occurs in late April or early May, but may occur year-round. Females migrate from the aquatic site to an upland location (1,310 feet or more), and deposit from one to thirteen eggs in a shallow excavation. Female may lay more than one clutch a year. Oviposition occurs during May and June, although some individuals may deposit eggs as early as late April and as late as early August (Jennings and Hayes 1994).

Within the Project Area, there is ample habitat suitable for supporting populations of turtles. The presence of western pond turtles was confirmed during reconnaissance-level wildlife surveys in May 2006, from multiple sites around the reservoir. A nest was also discovered during wildlife surveys conducted in June 2006, but this nest had been depredated.

Fifty-three observations of WPT were made during visual surveys (Table 4-6, Appendix D figure) in 2006 and 2007. Most of the pond turtles were seen basking near the shore of UCSR and LCSR and quickly fled into the water when disturbed. No turtles were observed in TDP or Stilling Basin. Homestead Pond supports at least three WPT.

Table 4-6: Results for Western Pond Turtle (WPT) Surveys in the Project Area

Observation Date	Age Class	Condition	Wetland[1]
3/1/2006	A	Alive	WET1
7/5/2006	A	Alive	WET1

Table 4-6: Results for Western Pond Turtle (WPT) Surveys in the Project Area

Observation Date	Age Class	Condition	Wetland[1]
2/24/2006	A	Alive	WET102
2/24/2006	A	Alive	WET102
2/24/2006	A	Alive	WET102
2/24/2006	A	Alive	WET102
2/5/2007	A	Alive	WET102
3/14/2007	A	Alive	WET102
3/14/2007	A	Alive	WET102
2/20/2006	A	Alive	WET104
3/6/2006	A	Alive	WET104
2/8/2006	A	Alive	WET111
2/8/2006	A	Alive	WET111
2/5/2007	A	Alive	WET111
7/20/2006	A	Alive	WET168
2/13/2006	A	Alive	WET17
4/4/2006	A	Alive	WET172
8/23/2006	A	Alive	WET172
2/15/2006	A	Alive	WET173
2/15/2006	A	Alive	WET173
2/15/2006	A	Alive	WET173
2/23/2006	A	Alive	WET173
3/6/2006	A	Alive	WET173
3/6/2006	A	Alive	WET173
8/15/2006	A	Alive	WET19
2/6/2006	A	Alive	WET2
2/6/2006	A	Alive	WET2
2/6/2006	A	Alive	WET2
2/6/2006	A	Alive	WET2
2/8/2006	A	Alive	WET2
1/22/2007	A	Alive	WET2
3/2/2007	A	Alive	WET2
3/2/2007	A	Alive	WET2
3/8/2007	A	Alive	WET2
1/29/2007	A	Alive	WET31
2/13/2006	A	Alive	WET42
2/15/2006	A	Alive	WET52
2/15/2006	A	Alive	WET52
1/30/2007	A	Alive	WET52
3/1/2007	A	Alive	WET65
2/21/2006	A	Dead	WET85
2/22/2006	A	Alive	WET92
2/10/2006	A	Alive	WET97

Table 4-6: Results for Western Pond Turtle (WPT) Surveys in the Project Area

Observation Date	Age Class	Condition	Wetland[1]
2/10/2006	A	Alive	WET97
2/10/2006	A	Alive	WET97
2/10/2006	A	Alive	WET97
2/10/2006	A	Alive	WET97
2/10/2006	A	Alive	WET97
2/10/2006	A	Alive	WET97
2/10/2006	A	Alive	WET97
2/10/2006	A	Alive	WET97
2/10/2006	A	Alive	WET97

[1] see map in appendix d for location code sites

5.0 REFERENCES

Atsatt, P. R. and T. Ingram. 1983. Adaptation to oak and other fibrous, phenolic-rich foliage by a small mammal, *Neotoma fuscipes*. Oecologia, 60:135-142.

Baltz, D. M. and P. B. Moyle. 1984. Segregation by species and size classes of rainbow trout, *Salmo gairdneri*, and Sacramento sucker, *Catostomus occidentalis*, in three California streams. Envir. Bio. Fish. 10:101-110.

Barnhardt, R. B. 1991. Steelhead (*Oncorhynchus mykiss). In*: J. Stolz and J. Schnell, eds., Trout. Harrisburg, Pennsylvania: Stackpole Books. Pp. 324-336.

Barnhart, R. A. 1986. Species profiles: life histories and environmental requirements of coastal fishes and invertebrates (Pacific Southwest): steelhead. U.S. Fish and Wildlife Service Biological Report, Vol. 82, No. 11, US Army Corps of Engineers, TR EL-82-4.

Barrett, R. H. 1980. Mammals of California oak habitats: management implications. *In*: Plumb, T. R., tech. coord. Ecology, management, and utilization of California oaks. U.S .Department of Agriculture, Forest Service. (Berkeley, California), Gen. Tech. Rep. PSW-44. Pages 275-291.

Barry, S. J. 1978. Investigations on the occurrence of the San Francisco garter snake at Mori Point, San Mateo County, California. Unpublished report prepared for Environmental Science Associates, Foster City, California.

Barry, S. J. 1994. The distribution, habitat, and evolution of the San Francisco garter snake, *Thamnophis sirtalis tetrataenia*. Thesis, University of California, Davis.

Barry, S. J. 1996. The San Francisco garter snake (*Thamnophis sirtalis tetrataenia*) on the San Francisco Watershed. San Francisco Public Utilities Commission.

Beedy, E. C. and W. J. Hamilton III. 1997. Tricolored blackbird status update and management guidelines. Unpublished report for US Fish and Wildlife Service and California Department of Fish and Game.

Björnn, T. C. and D. W. Reiser. 1991. Habitat requirements of salmonids in streams. American Fisheries Society Special Publication 19:83-138.

Bovee, K. D. 1978. Probability-of-use criteria for the family Salmonidae. Instream Flow Information Paper 4, U.S. Fish and Wildlife Service, FWS/OBS-78-07.

Brett, J. R. 1971. The metabolic demand for oxygen in fish, particularly salmonids, and a comparison with other vertebrates. Respiration Physiology, 14:151-170.

Burridge, B. 1995. Sonoma County breeding bird atlas: detailed maps and accounts for our nesting birds. Santa Rosa, California: Madrone Audubon Society.

Busby, P. J., T. C. Wainwright, G. J. Bryant, L. Lierheimer, R. S. Waples, F. W. Waknitz, and I. V. Legomarsino 1996. Status review of west coast steelhead from Washington, Idaho, Oregon and California. US Department of Commerce, NOAA Technical Memorandum, NMFS-NWFSC-27.

California Department of Fish and Game (CDFG). 1992. 1991 Annual report on the status of California state listed threatened and endangered animals and plants. Sacramento, California: Resources Agency, Department of Fish and Game.

__________ .2000a. California Wildlife Habitat Relationships System: (CWHR Database Version 7.0) [FoxPro program]. CDFG Natural Heritage Division. Rancho Cordova, California.

__________. 2000b. Guidelines for assessing the effects of proposed projects on rare, threatened, and endangered plants and natural communities. Guidelines produced for the California Department of Fish and Game. May 8, 2000. Revision of Guidelines dated December 9, 1983.

__________. 2000c. The status of rare, threatened, and endangered animals and plants in California: California least tern.

__________. 2005. Rarefind 2, California Natural Diversity Database. Records for Montara Mountain, San Mateo, and Woodside quadrangles. Electronic database. Sacramento, California.

__________. 2006a. California Department of Fish and Game, Natural Diversity Database. January 2006. Special vascular plants, bryophytes, and lichens list. Quarterly publication, Mimeo. 97pp. Available at: http://www.dfg.ca.gov/whdab/pdfs/spplants.pdf. Site accessed February 2006.

__________. 2006b. State of California Department of Fish and Game Habitat Conservation Division Wildlife and Habitat Data Analysis California Natural Diversity Database. Special animals. February 2006. Available at: http://www. dfg. ca. gov/whdab/pdfs/SPAnimals.pdf. Site accessed September, 2006.

__________. 2006c. California Department of Fish and Game, Natural Diversity Database. August 2006. Special vascular plants, bryophytes, and lichens list. Quarterly publication, Mimeo. 89pp. Available at: http://www.dfg.ca.gov/whdab/pdfs/spplants.pdf. Site accessed August 2006.

__________. 2006d. Rarefind 3, California Natural Diversity Database. Records for Montara Mountain, San Mateo, and Woodside quadrangles. Electronic database. Sacramento, California.

California Native Plant Society (CNPS). 2001. Inventory of rare and endangered vascular plants of California (sixth edition). Rare Plant Scientific Advisory Committee, David P. Tibor, Convening Editor. California Native Plant Society. Sacramento, CA. 388pp.

__________. 2006. Inventory of rare and endangered plants (online edition, v7-06c). California Native Plant Society. Sacramento, CA. Available at http://www. cnps.org/inventory.

Carraway, L. N. and B. J. Verts. 1991. *Neotoma fuscipes*. Mammalian Species 386:1-10.

Cowardin, L. M., V. Carter, F. Golet, and E. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States. Washington, DC: US Department of the Interior, US Fish and Wildlife Service.

Cramer S. P. and 16 co-authors. 1995. The status of steelhead populations in California in regards to the Endangered Species Act. Special Report Submitted to National Marine Fisheries Service on behalf of Association of California Water Agencies.

Cranford, J.A. 1982. The effect of woodrat houses on population density of *Peromyscus*. J. Mammal. 63:663-666.

Eddleman, W. R., R. E. Flores, and M. L. Legare. 1994. Black rail (*Laterallus amaicensis*). In: Poole, A. and F. Gill, eds. The Birds of North America, No. 533. Philadelphia, Pennsylvania: The Birds of North America, Inc.

ENTRIX, Inc. 2006a. Draft wildlife technical report for the proposed Lower Crystal Springs Dam Improvement Project. Unpublished report prepared for the San Francisco Public Utilities Commission.

ENTRIX, Inc. 2006b. Draft botanical technical report for the proposed Lower Crystal Springs Dam Improvement Project. Unpublished report prepared for the San Francisco Public Utilities Commission.

ENTIRX, Inc. 2008. Upper and Lower San Mateo and Laguna Creeks Fish Habitat Surveys for the proposed Lower Crystal Springs Dam Improvements Project. Unpublished report prepared for the San Francisco Public Utilities Commission.

Environmental Services Agency (ESA). 1994. San Francisco Watershed Management Plan. Peninsula Watershed Natural and Cultural Resources. Unpublished report prepared for EDAW under contract to the San Francisco Water Department.

Evens, J., G. W. Page, S. A .Layman, and R. W. Stallcup. 1991. Distribution, relative abundance and status of the California black rail in western North America. Condor 93: 952-966.

Faber, P. M. and R. F. Holland. 1988. Common riparian plants of California. Mill Valley, California: Pickleweed Press.

Faber, P. M. 1982. Common wetland plants of coastal California. Mill Valley, California: Pickleweed Press.

Fausch, K. D. 1984. Profitable stream positions for salmonids: relating specific growth rate to net energy gain. Canadian Journal of Zoology 62:441-451.

Federal Register. 1967. 50 CFR Part 17, Page 4001. Endangered species list. March 11, 1967 (Volume 32).

Federal Register. 1970a. 50 CFR Part 17, Page 8491-8498. Conservation of endangered species and other fish or wildlife (First list of endangered foreign fish and wildlife as Appendix A). June 2, 1970 (Volume 35).

Federal Register. 1970b. 50 CFR Part 17, Page 16047-16048. Appendix D – United States list of endangered native fish and wildlife. October 13, 1970 (Volume 35).

Federal Register. 1976. 50 CFR Part 17, Page 22041-22044. Determination that six species of butterfly are endangered species. June 1, 1976 (Volume 41 Number 106).

Federal Register. 1977. 50 CFR Part 17, Page 7972-7975. Endangered and threatened wildlife and plants; proposed determination of critical habitat for six butterflies and two plants. February 8, 1977 (Volume 42 Number 26).

Federal Register. 1987. 50 CFR Part 17, Page 35365. Endangered and threatened wildlife and plants; determination of threatened status for the bay checkerspot butterfly (*Euphydryas editha bayensis*). September 18, 1987 (Volume 52 Number 181).

Federal Register. 1992a. 50 CFR Part 17, Page 27848. Final rule: Endangered and threatened wildlife and plants; six plants and Myrtle's silverspot butterfly from coastal dunes in Northern and Central California determined to be endangered. June 22, 1992 (Volume 57).

Federal Register. 1992b. 50 CFR Part 17, Page 45328-45337. Endangered and threatened wildlife and plants; determination of threatened status for the Washington, Oregon, and California population of the marbled murrelet. October 1, 1992 (Volume 57 Number 191).

Federal Register. 1993. 50 CFR Part 17, Page 12864-12874. Endangered and threatened wildlife and plants; determination of threatened status for the Pacific Coast population of the western snowy plover. March 5, 1993 (Volume 58 Number 42).

Federal Register. 1995. 50 CFR Part 17, Page36000-36010. Endangered and threatened wildlife and plants; final rule to reclassify the bald eagle from endangered to threatened in all of the lower 48 states. July 12, 1995 (Volume 60 Number 133).

Federal Register. 1996a. 50 CFR Part 17, Page 25813-25833. Endangered and threatened wildlife and plants; determination of threatened status for the California red-legged frog. May 23, 1996 (Volume 61, Number 101).

Federal Register. 1996b. 50 CFR Part 17, Page 26356-26320. Endangered and threatened wildlife and plants; final designation of critical habitat for the marbled murrelet. May 24, 1996 (Volume 61, Number 102).

Federal Register. 1996c. 50 CFR Parts 222 and 227, Page 41541-41561. Proposed threatened status for five ESUs of steelhead in Washington, Oregon, Idaho and California. Federal Register, (Volume 61, No. 155).

Federal Register. 1999. 50 CFR Part 17, Page 46542-46558. Endangered and threatened wildlife and plants; final rule to remove the American peregrine falcon from the federal list of Endangered and Threatened Wildlife, and to remove the similarity of appearance provision for free-flying peregrines in the conterminous United States. August 25, 1999 (Volume 64 Number 164).

Federal Register. 2001. 50 CFR Part 17, Page 21450. Endangered and threatened wildlife and plants; final determination of critical habitat for the bay checkerspot butterfly (*Euphydryas editha bayensis*). April 30, 2001 (Volume 66 Number 83).

Federal Register. 2004. 50 CFR Part 17, Page 47212-47248. Determination of threatened status for the California tiger salamander; and special rule exemption for existing routine ranching activities. August 4, 2004 (Volume 60, Number 149).

Federal Register. 2005a. 50 CFR Part 17, Page 49380-49458. Endangered and threatened wildlife and plants; designation of critical habitat for the California tiger salamander, Central Population; final rule. August 23, 2005 (Volume 70, Number 162).

Federal Register. 2005b. 50 CFR Part 226, Page 52488-52627. Endangered and threatened wildlife and plants; designation of critical habitat for seven Evolutionarily Significant Units of Pacific salmon and steelhead in California; final rule. September 2, 2005 (Volume 70, Number 170).

Federal Register. 2006a. 50 CFR Parts 223 and 224, Page 834-862. Endangered and threatened wildlife and plants; Final listing determinations for 10 distinct population segments of West Coast steelhead; final rule. January 5 2006 (Volume 71, Number 3).

Federal Register. 2006b. 50 CFR Part 17, Page 8238-8251. Endangered and threatened wildlife and plants; removing the bald eagle in the lower 48 states from the list of endangered and threatened wildlife: re-opening of comment period. February 16, 2006 (Volume 71, Number 32).

Federal Register. 2006c. 50 CFR Part 17, Page 19243-19292. Endangered and threatened wildlife and plants; designation of critical habitat for the California red-legged frog, and special rule exemption associated with final listing for existing routine ranching activities; Final Rule. April 13, 2006 (Volume 71, Number 71).

Federal Register. 2007a. 50 CFR Part 17, Page 37345-37372. Endangered and threatened wildlife and plants; removing the bald eagle in the lower 48 states from the list of endangered and threatened wildlife; final rule. July 9, 2007 (Volume 72, Number 130).

Federal Register. 2007b. 50 CFR Part 17, Page 48178-48218. Endangered and threatened wildlife and plants; designation of critical habitat for the bay checkerspot butterfly (Euphydryas editha bayensis). August 22, 2007 (Volume 72, Number 126).

Federal Register. 2008. 50 CFR Part 17, Page 53492-53680. Endangered and threatened wildlife and plants; revised critical habitat for the California red-legged frog (*Rana aurora draytonii*). September 16, 2008 (Volume 73, Number 180).

Fox, W. 1951. The status of the garter snake *Thamnophis sirtalis tetrataenia*. Copeia 1951: 257-267.

GGNPA Contractors (GGNPA). 2001. Special status vascular plant species monitoring report San Francisco Watershed District. Unpublished report prepared for the Golden Gate National Parks Association, National Park Service, Golden Gate National Recreation Area, Fort Mason, San Francisco, California 94123.

Grinnell, J., and A. H. Miller. 1944. The distribution of the birds of California. Pac. Coast Avifauna No. 27. 608pp.

Hagar, J. M. 1996. Draft report on steelhead spawning in Salinas River tributaries during the 1995-96 season and minimum migration flow requirements for steelhead in the Lower Salinas River. Unpublished report prepared for Monterey County Water Resources Agency, California.

Harvey, T. E. 1980. California clapper rail survey, 1978-1979. Unpublished report prepared for the California Department of Fish and Game, Job, Final Report, Job V-1. 8, July 1980.

Hickman, J. C., ed. 1993. The Jepson manual: higher plants of California. Berkeley and Los Angeles, California: University of California Press.

Hitchcock, A. S. and A. Chase. 1971. Manual of the Grasses of the United States. Vols. 1 and 2. Dover Publications. New York, New York.

Holland, R. F. 1986. Preliminary descriptions of the terrestrial natural communities of California. State of California, The Resources Agency, Nongame Heritage Program, Department of Fish and Game, Sacramento, California. 156pp.

Jennings, M. R. 1988. Natural history and decline of native ranids in California. *In*: De Lisle, H, F,. P. R. Brown, B. Kaufman and B. M. McGurty, eds. Proceedings of the conference on California herpetology. Southwestern Herpetologists Society.

Jennings, M. R. and M. P. Hayes. 1988. Habitat correlates of distribution of the California red-legged frog (*Rana aurora draytonii*) and the foothill yellow-legged frog (*Rana boylii*): Implications for management. *In*: Sarzo, R. , K. E. Severson, and D. R. Patton, (technical coordinators). Proceedings of the symposium on the management of amphibians, reptiles, and small mammals in North America. USDA. Forest Service General Technical Report RM-166. Pp. 144-158.

Jennings, M. R. and M. P. Hayes. 1994. Amphibian and reptile species of Special Concern in California. California Department of Fish and Game, Rancho Cordova, California.

Jennings, M. R., M. P. Hayes, and D. C. Holland. 1992. A petition to the US Fish and Wildlife Service to place the California red-legged frog (*Rana aurora draytonii*) and the western pond turtle (*Clemmys marmorata*) on the list of endangered and threatened wildlife and plants.

Johnsgard, P. A. 1990. Hawks, eagles, and falcons of North America. Smithsonian Institution Press. Washington and London.

Kossack, D. S. (No Date) Monitoring and Management of Native Amphibians in the Crystal Springs and Alameda Creek Watersheds San Francisco Water Department. Unpublished report. 37pp.

Larsen, S. 1994. Life history aspects of the San Francisco garter snake at the Millbrae habitat site. Unpublished M.S., California State University, Hayward.

Leidy, R. A. G. S. Becker, and B. N. Harvey. 2005. Historical distribution and current status of steelhead/rainbow trout (*Oncorhynchus mykiss*) in streams of the San Francisco Estuary, California. Oakland, California: Center for Ecosystem Management and Restoration.

Lowther, P. E. and C. T. Collins. 2002. Black swift (*Cypseloides niger*). *In*: Poole, A. and F. Gill, eds. The birds of North America, No. 533. Philadelphia, Pennsylvania: The Birds of North America, Inc.

Lum, K. L. 1975. Gross patterns of vascular plant species diversity in California. Unpublished MS Thesis, Ecology. University of California, Davis. 154pp.

Martin, J. W. and B. A. Carlson. 1998. Sage sparrow (*Amphispiza belli*). *In*: Poole, A. and F. Gill, eds. The birds of North America, No. 533. Philadelphia, Pennsylvania: The Birds of North America, Inc.

Mason H. L. 1957. A flora of the marshes of California. Berkeley: University of California Press. 878p.

Mayer, K. E. and W. F. Laudenslayer. 1988. A guide to wildlife habitats of California. California Department of Fish and Game, Sacramento, California.

McGinnis, S.M. 1998. The status of the San Francisco garter snake (*Thamnophis sirtalis tetrataenia*) and the California red-legged frog (*Rana aurora draytonii*) within the greater shoreline areas of Upper and Lower Crystal Springs Reservoir, San Mateo County, California. Unpublished report prepared for EIP Associates, San Francisco.

Moyle, P. B. 2002. Inland fishes of California, Revised and Expanded. Berkeley, California: University of California Press.

Munz, P. A. and D. D. Keck. 1968. A California flora and supplement. Berkeley, California:University of California Press.

Nehlsen, W., J. E. Williams, and J. A. Lichatowich. 1991. Pacific salmon at the crossroads: stocks at risk from California, Oregon, Idaho and Washington. Fisheries 16(2):4-21.

Page, G. W., M . A. Stern, and P. W. C. Paton. 1995. Differences in wintering areas of snowy plovers from inland breeding sites in western North America. Condor 97: 258–262.

Page, G. W. and L. E. Stenzel. 1981. The breeding status of the snowy plover in California. Western Birds 12: 1–40.

Reiser, D. W. and T. C. Bjornn. 1979. Habitat requirements of anadromous salmonids. Prepared for U.S.D.A. Forest Service, Pacific Northwest Forest and Range Experiment Station, Portland, Oregon, General Tech. Report PNW-96.

Remsen, Jr. J. V. 1978. Bird species of special concern in California, double-crested cormorant: California Department of Fish and Game.

Robertson, J. M. 1929. Some observations on the feeding habits of the burrowing owl. Condor 31:38-39.

San Francisco Public Utilities Commission (SFPUC). 2006. Preliminary Mitigated Declaration for the Polhemus Creek Restoration Project. January 21, 2006.

Sawyer, J. O. and T. Keeler-Wolf. 1995. A manual of California vegetation. Sacramento: California Native Plant Society.

Scott, J. A. 1986. The butterflies of North America: A Natural History and Field Guide. Stanford, California: Stanford University Press.

Sedgwick, J. A. 2000. Willow flycatcher (*Empidonax traillii*). In: Poole, A. and F. Gill, eds. The birds of North America, No. 533. Philadelphia, Pennsylvania: The Birds of North America, Inc.

Seltenrich, C. and A. Pool. 2002. A standardized approach for habitat assessments and visual encounter surveys for the foothill yellow-legged frog (*Rana boylii*). Pacific Gas and Electric Company.

Shapovalov, L. and A. C. Taft. 1954. The life histories of the steelhead rainbow trout and silver salmon. State of California, California Department of Fish and Game, Fish Bulletin, No. 98.

Smith, A. K. 1973. Development and application of spawning velocity and depth criteria for Oregon salmonids. Transactions of the American Fisheries Society 102:312-316.

Smith, R. L. 1974. Ecology and field biology. New York: Harper and Row.

Stebbins, R. C. 1951, 1978. Amphibians of Western North America. Berkeley, California: University of California Press.

Stebbins, R. C. 2003. Western Reptiles and Amphibians. 3rd ed. New York: Houghton Mifflin Co.

Stuart, J. D. and J. O. Sawyer. 2001. Trees and shrubs of California. Berkeley, California: University of California Press.

Swaim Biological Consulting. 2003. Results of visual surveys for the reptiles and amphibians, Mud Dam 1 and Skyline Quarry sites in the Crystal Springs Reservoir Watershed, San Mateo County, California. Prepared for Merrit-Smith Consulting. June 27, 2003.

Swaim Biological, Inc. 2004. Habitat assessment for the San Francisco Garter Snake and California red-legged frog at Upper and Lower Crystal Springs Reservoirs, San Mateo County, California. Prepared for Water Infrastructure Partners. November 5, 2004.

Swaim Biological, Inc. 2005. Results of surveys for the San Francisco Garter Snake and California Red-Legged Frog at Mud Dam, Laguna Creek, and Skyline Quarry, San Mateo County, California. Prepared for URS Corporation. February 16, 2005

Swaim Biological, Inc. 2007 (in prep). Results of surveys for the San Francisco Garter Snake and California Red-Legged Frog at Pilarcitos Creek and San Mateo Dam # 2, San Mateo County, California. Prepared for Black & Veatch,

Thelander, C. ed. 1994. Life on the Edge: a Guide to California's Endangered Natural Resources. Santa Cruz, CA: BioSystem Books.

Thompson, B. C., J. A. Jackson, J. Burger, L. A. Hill, E. M. Kirsch, and J. L. Atwood. 1997. Least tern (*Sterna antillarum*). In: A. Poole, A. and F. Gill, eds. The birds of North America, No. 290. Philadelphia, Pennsylvania: The Academy of Natural Sciences and Washington, D. C. The American Ornithologists' Union.

United States Fish and Wildlife Service (USFWS). 2002a. General rare plant survey guidelines. Ellen A. Cypher, California State University, Stanislaus Endangered Species Recovery Program. Bakersfield, California. July 2002.

United States Fish and Wildlife Service (USFWS). 2002b. Recovery plan for the California red-legged frog (*Rana aurora draytonii*). US Fish and Wildlife Service, Portland, Oregon.

__________. 2006. Federally endangered and threatened species that occur in or may be affected by projects in the counties and/or USGS 7 1/2 minute quads for Montara Mountain, San Mateo, and Woodside. US Fish and Wildlife Service Sacramento District office database. Available at: http://www. fws. gov/sacramento/es/spp_lists/auto_list_form. cfm. Accessed March 2006.

United States Geological Survey (USGS). 2006. Southwestern willow flycatcher habitats. USGS Southwest Biological Science Center - Colorado Plateau Field Station at Northern Arizona University. Last updated 5/30/06. Available at: http://www. usgs. nau. edu/swwf/index.html.

Unitt, P. 1984. The birds of San Diego County. San Diego, CA: San Diego Society Natural History.

University of California Berkeley, Essig Museum of Entomology (Essig Museum). 2006 California's Endangered Insects.

Verner, J. 1980. Birds of California oak habitats: management implications. *In*: Plumb, T. R. tech. coord. Ecology, management, and utilization of California oaks. U.S .Department of Agriculture, Forest Service. (Berkeley, Calif.) Gen. Tech. Rep. PSW-44. Pages 246-264

Vestal, E. H. 1938. Biotic relations of the wood rat (*Neotoma fuscipes*) in the Berkeley Hills. Journal of Mammalology 19:1-36.

Wesche, T. A. and P. A. Rechard. 1980. A Summary of instream flow methods for fisheries and related research needs. Water Resources Research Institute, Eisenhower Consortium, Bulletin 9.

Williams, D. F. 1986. Mammalian species of special concern in California. Sacramento: California Department of Fish and Game.

Zeiner, D. C., W. F. Laudenslayer, Jr. , K. E. Mayer, and M. White, eds. 1988. California's Wildlife Volume I: amphibians and reptiles. Sacramento, California: California Department of Fish and Game.

__________. 1990a. California's wildlife: Volume II: birds. Sacramento, California: California Department of Fish and Game.

__________. 1990b. California's wildlife: Volume III: mammals. Sacramento, California: California Department of Fish and Game.

Appendix A

Special-status Species with Potential to Occur in the Project Vicinity

Table A-1: Special-status Plant Species with Potential to Occur in the Project Vicinity

SCIENTIFIC NAME COMMON NAME	LISTING STATUS	PHENOLOGY	FLOWERING PERIOD	HABITAT CONDITIONS	POTENTIAL TO OCCUR
Acanthomintha duttonii San Mateo thorn mint	FE CE CNPS 1B	Annual herb	Apr – June	Chaparral, valley and foothill grassland and coastal scrub. Extant populations only known from very uncommon serpentinite vertisol clays; in relatively open areas. Elevation 165 to 660 feet.	HIGH
Allium peninsulare var. franciscanum Franciscan onion	CNPS 1B	Perennial herb (bulbiferous)	May – Jun	Cismontane woodland, and valley and foothill grassland. Clay soils; often on serpentine. Dry hillsides. Elevation 330 to 985 feet.	KNOWN
Amsinckia lunaris Bent-flowered fiddleneck	CNPS 1B	Annual herb	Mar – Jun	Cismontane woodland, and valley and foothill grassland. Elevation 165 to 1,640 feet.	MODERATE
Arctostaphylos andersonii Santa Cruz manzanita	CNPS 1B	Shrub (evergreen)	Nov – Apr	Broadleaved upland forest, chaparral, and north coast coniferous forest. Open sites, redwood forest. Elevation 590 to 2,625 feet.	LOW
Arctostaphylos montaraensis Montara manzanita	CNPS 1B	Shrub (evergreen)	Jan – Mar	Chaparral and coastal scrub. Slopes and ridges. Elevation 490 to 1,640 feet.	LOW
Arctostaphylos regismontana Kings Mountain manzanita	CNPS 1B	Shrub (evergreen)	Jan – Apr	Broadleaved upland forest, chaparral, and north coast coniferous forest. Granitic or sandstone outcrops. Elevation 1,000 to 2,400 feet.	LOW

Table A-1: Special-status Plant Species with Potential to Occur in the Project Vicinity, continued

SCIENTIFIC NAME COMMON NAME	STATUS	PHENOLOGY	FLOWERING PERIOD	HABITAT CONDITIONS	POTENTIAL TO OCCUR
Astragalus pycnostachyus var. pycnostachyus Coastal marsh milk-vetch (or brine milk-vetch)	CNPS 1B	Perennial herb	Apr – Oct	Coastal dunes, coastal salt marshes. Mesic sites in dunes, or along streams or coastal salt marshes. Elevation sea level to 98 feet.	LOW
Centromadia (or *Hemizonia*) *parryi* ssp. *parryi* pappose tarplant	CNPS 1B	Annual herb	May/Jun – Nov	Coastal prairie, meadows and seeps, coastal salt marsh, valley and foothill grassland. Vernally mesic, often alkaline sites. Elevation 6 to 1,380 feet.	LOW
Chorizanthe cuspidate var. *cuspidate* San Francisco Bay spineflower	CNPS 1B	Annual herb	Apr – Aug	Coastal bluff scrub, coastal dunes, coastal prairie and coastal scrub. Closely related to *C. pungens*. Sandy soil on terraces and slopes. Elevation 15 to 1,805 feet.	LOW
Cirsium andrewsii Franciscan thistle	CNPS 1B	Perennial herb	Mar – Jul	Coastal bluff scrub, broadleaved upland forest and coastal scrub. Sometimes serpentine seeps. Elevation sea level to 440 feet.	LOW
Cirsium fontinale var. *fontinale* fountain thistle	FE CE CNPS 1B	Perennial herb	Jun – Oct	Valley and foothill grassland and chaparral. Serpentine seeps and grassland. Elevation 295 to 590 feet.	KNOWN
Collinsia multicolor San Francisco collinsia	CNPS 1B	Annual herb	Mar – May	Closed-cone coniferous forest and coastal scrub, on decomposed shale (mudstone) mixed with humus. Elevation 100 to 820 feet.	KNOWN
Cordylanthus maritimus ssp. *palustris* Point Reyes bird's-beak	CNPS 1B	Annual herb, hemiparasitic	Jun – Oct	Coastal salt marsh, usually with *Salicornia, Distichlis, Jaumea, Spartina*, etc. Elevation sea level to 50 feet.	LOW

Table A-1: Special-status Plant Species with Potential to Occur in the Project Vicinity, continued

SCIENTIFIC NAME COMMON NAME	STATUS	PHENOLOGY	FLOWERING PERIOD	HABITAT CONDITIONS	POTENTIAL TO OCCUR
Dirca occidentalis western leatherwood	CNPS 1B	Shrub (deciduous)	Jan – Apr	Broadleaved upland forest, chaparral, closed-cone coniferous forest, cismontane woodland, north coast coniferous forest, riparian forest, and riparian woodland. On brushy slopes, mesic sites; mostly in mixed evergreen and foothill woodland communities. Elevation 100 to 1,805 feet.	KNOWN
Elymus californicus California bottle-brush grass	CNPS 4	perennial herb	May – Aug (Nov)	North coast coniferous forest, cismontane woodland and riparian woodland. In sandy humus soils. Elevation 450 to 1,490 feet.	KNOWN
Eriophyllum latilobum San Mateo woolly sunflower	FE CE CNPS 1B	Perennial herb	May – Jun	Cismontane woodland, often on roadcuts; found on and off of serpentine. Elevation 150 to 490 feet.	HIGH
Fritillaria biflora var. *ineziana* (or *F. grayana)* Hillsborough chocolate lily (or Gray's fritillary)	CNPS 1B	Perennial herb (bulbiferous)	Mar – April	Cismontane woodland, valley and foothill grassland, probably on serpentine grassland. Known only from the Hillsbrorough area. Elevation 295 to 525 feet.	MODERATE
Fritillaria liliacea fragrant fritillary	CNPS 1B	Perennial herb (bulbiferous)	Feb – Apr	Coastal scrub, valley and foothill grassland and coastal prairie. Often on serpentine; various soils reported, though usually clay. Elevation 10 to 1,345 feet.	KNOWN
Grindelia hirsutula var. *maritime* San Francisco gumplant	CNPS 1B	Perennial herb (bulbiferous)	Aug - Sep	Coastal scrub, coastal bluff scrub, valley and foothill grassland. Sandy or serpentine slopes, sea bluffs. Elevation 50 to 1,310 feet.	LOW
Hesperolinon congestum Marin western flax	FT CT CNPS 1B	Annual herb	Apr – July	Chaparral, valley and foothill grassland. In serpentine barrens, and in serpentine grassland and chaparral. Elevation 100 to 1,200 feet.	KNOWN

Table A-1: Special-status Plant Species with Potential to Occur in the Project Vicinity, continued

SCIENTIFIC NAME COMMON NAME	STATUS	PHENOLOGY	FLOWERING PERIOD	HABITAT CONDITIONS	POTENTIAL TO OCCUR
Horkelia marinensis Point Reyes horkelia	CNPS 1B	Perennial herb	May – Sept	Coastal dunes, coastal prairie, coastal scrub. Sandy flats and dunes near coast; in grassland or scrub plant communities. Known from fewer than 20 occurrences. Elevation 15 to 100 feet.	LOW
Leptosiphon (or *Linanthus*) *croceus* coast yellow leptosiphon, coast yellow linanthus	CNPS 1B	Annual herb	May	Coastal bluff scrub and coastal prairie. Elevation 30 to 490 feet.	LOW
Leptosiphon (or *Linanthus*) *rosaceus* rose leptosiphon, rose linanthus	CNPS 1B	Annual herb	Apr – Jun	Coastal bluff scrub. Elevation sea level to 330 feet.	LOW
Lessingia arachnoidea Crystal Springs lessingia	CNPS 1B	Annual herb	July – Oct	Coastal sage scrub, valley and foothill grassland, cismontane woodland. Grassy slopes on serpentine; sometimes on roadsides. Elevation 200 to 655 feet.	KNOWN
Malacothamnus arcuatus (or *M. fasciculatus*) arcuate bush mallow	CNPS 1B	Shrub (evergreen)	Apr – Sep	Chaparral on gravelly alluvium. Elevation 260 to 1,165 feet.	KNOWN
Pedicularis dudleyi Dudley's lousewort	CR CNPS 1B	Perennial herb	April – June	Chaparral (maritime) cismontane woodland, north coast coniferous forest, and valley and foothill grassland. In deep shady woods of older coast redwood forests. Elevation 200 to 2,950 feet.	MODERATE

Table A-1: Special-status Plant Species with Potential to Occur in the Project Vicinity, continued

SCIENTIFIC NAME COMMON NAME	STATUS	PHENOLOGY	FLOWERING PERIOD	HABITAT CONDITIONS	POTENTIAL TO OCCUR
Pentachaeta bellidiflora white-rayed pentachaeta	FE CE CNPS 1B	Annual herb	Mar – May	Valley and foothill grassland. Open dry rocky slopes and grassy areas, often on soils derived from serpentine bedrock. Elevation 115 to 2,035 feet.	HIGH
Plagiobothrys chorisianus var. *chorisianus* Choris's popcorn-flower	CNPS 1B	Annual herb	Mar – Jun	Chaparral, coastal scrub and coastal prairie; mesic sites. Elevation 50 to 330 feet.	LOW
Potentilla hickmanii Hickman's cinquefoil, Hickman's potentilla	FE CE CNPS 1B	Perennial herb (bulbiferous)	Apr – Aug	Coastal bluff scrub, closed-cone coniferous forest, meadows and seeps, marshes and swamps. Freshwater marshes, seeps, and small streams in open or forested areas along the coast. Elevation 15 to 405 feet.	LOW
Silene verecunda ssp. *verecunda* Mission Delores (or San Francisco) campion	CNPS 1B	Perennial herb (bulbiferous)	Mar – Aug	Coastal scrub, valley and foothill grassland, coastal bluff scrub, chaparral and coastal prairie. Often on mudstone or shale; rarely on serpentine. Elevation 100 to 2,115 feet.	LOW
Trifolium depauperatum var. *hydrophilum* water sack (or saline) clover	CNPS 1B	Annual herb	Apr – Jun	Marshes and swamps, valley and foothill grassland and vernal pools. Mesic, alkaline sites. Elevation sea level to 985 feet.	LOW
Triphysaria floribunda San Francisco owl's clover	CNPS 1B	Annual herb	April – June	Coastal prairie, coastal scrub, valley and foothill grassland. On serpentine and nonserpentine substrate. Elevation 35 to 525 feet.	LOW

Table A-1: Special-status Plant Species with Potential to Occur in the Project Vicinity, continued

SCIENTIFIC NAME COMMON NAME	STATUS	PHENOLOGY	FLOWERING PERIOD	HABITAT CONDITIONS	POTENTIAL TO OCCUR
Tropidocarpum capparideum caper fruited tropidocarpum	CNPS 1B	Annual herb	March – April	Valley foothill grassland, alkaline hills, alkaline clay. Last seen in 1957, then rediscovered at Fort Hunter Ligget. Elevation sea level to 1,490 feet.	LOW

Sources

CDFG 2006a, CDFG 2006b, CNPS 2001, CNPS 2006, CalFlora 2005.

Codes

LOW = Habitat not present in the Project Area, and/or few occurrences in the region
MOD = Marginal habitat present in the Project Area, and/or some occurrences in the region
HIGH = Good habitat present in the Project Area, and/or nearby occurrences
KNOWN = Species is known to occur in the Project Area, based on CNDDB occurrences or recent field surveys
FE: Federally Endangered
FT: Federally listed as Threatened
CE: State of California Endangered
CT: State of California Threatened
CR: State of California Rare
CNPS - California Native Plants Society
    1A - Presumed Extinct in California.
    1B - Rare, Threatened, or Endangered in California and elsewhere.
    2 - Rare, Threatened, or Endangered in California, but more common elsewhere
    3 - Plants about which we need more information - a review list
    4 - Plants of Limited Distribution – a watch list
-- Not listed

Table A-2: Special-status Wildlife Species with Potential to Occur in the Project Vicinity

Name	Status	Habitat	Potential to Occur
Invertebrates			
Edgewood blind harvestman *Calicina (=sitalcina) minor*		Open grassland in xeric environments. Found beneath serpentine rocks in grassland adjacent to scrub oaks.	Limited potential to occur. Some stands of oak woodland are adjacent to serpentine areas with grasslands on the east shores of the reservoirs.
San Bruno elfin butterfly *Callophrys mossii bayensis*	FE	Coastal, mountainous areas with grassy ground cover, mainly in the vicinity of San Bruno Mountain, San Mateo County. Colonies are located on steep, north-facing slopes within the fog belt. Larval host plant is *Sedum spathulifolium*.	No plants of *Sedum spathulifolium* were found in the Project Area during surveys in 2006. This species is not expected to occur.
Monarch butterfly *Danaus plexippus*		Winter roost sites extend along the coast from northern Mendocino to Baja California, Mexico. Roosts located in wind-protected tree groves (Eucalyptus, Monterey pine, cypress), with nectar and water sources nearby	May occur. Potential winter roost trees are present in the Project Area, but no winter roosts have been reported.
Bay checkerspot butterfly *Euphydryas editha bayensis*	FT	Restricted to native grasslands on outcrops of serpentine soil in the vicinity of San Francisco Bay. *Plantago erecta* is the primary host plant; *Orthocarpus densiflorus* and *O. purpurscens* are the secondary host plants.	*Plantago erecta* and *Orthocarpus* plants were found in the Project Area during surveys in 2006. This butterfly may occur.
Black abalone *Haliotis cracherodii*	FC, CSC	Mid to low rocky intertidal areas.	No potential to occur. No habitat.
White abalone *Haliotis sorenseni*	FE	Rocky pinnacles and deep reefs in Southern California; especially those off the channel islands. Live at depths of at least 80 feet to over 200 feet.	No potential to occur. No habitat.
Ricksecker's water scavenger beetle *Hydrochara rickseckeri*		Aquatic.	One collection from the vicinity of the Pulgas Water Temple.
San Francisco forktail damselfly *Ischnura gemina*		Endemic to the San Francisco Bay area. Small, marshy ponds and ditches with emergent and floating aquatic vegetation.	Limited habitat may be available at Tracy Lake.

Table A-2: Special-status Wildlife Species with Potential to Occur in the Project Vicinity, continued

Name	Status	Habitat	Potential to Occur
Invertebrates, continued			
bumblebee scarab beetle *Lichnanthe ursina*		Inhabits coastal sand dunes from Sonoma County south to San Mateo County. Usually flies close to sand surface near the crest of the dunes.	No potential to occur. No habitat.
Edgewood Park micro-blind harvestman *Microcina edgewoodensis*		Open grassland in areas of serpentine bedrock. Found on the underside of moist serpentine rocks near permanent springs.	Unlikely to occur. Although there is grassland on serpentine in the Project Area, it is not associated with permanent springs.
San Francisco lacewing *Nothochrysa californica*		Woodland, riparian, and scrub in Coast Range from Mendocino to Los Angeles Counties.	
Mission blue butterfly *Plebejus icarioides missionensis*	FE	Inhabits grasslands of the San Francisco Peninsula. Three larval host plants: *Lupinus albifrons, L. variicolor*, and *L. formosus*, of which *L. albifrons* is favored.	Five small individuals of Lupinus albifrons var. collinus were observed on the eastern shore of Lower Crystal Springs Reservoir during surveys in 2006. There is limited potential for this butterfly to occur in the Project Area, depending on the maximum water elevation for the Project.
Myrtle's silverspot butterfly *Speyeria zerene myrtleae*	FE	Restricted to the foggy, coastal dunes/hills of the Point Reyes Peninsula; extirpated from coastal San Mateo County. Larval foodplant thought to be *Viola adunca*.	No host species for this butterfly were found in ther Project Area during surveys in 2006.
Fish			
central California coastal steelhead *Oncorhynchus mykiss*	FE, CE	Cold-water streams tributary to the ocean.	Occurs in the San Mateo Creek watershed both upstream (Rainbow trout) and downstream from Lower Crystal Springs Reservoir (steelhead according to NMFS), but NMFS has classified San Mateo Creek as not containing critical habitat for steelhead.
Amphibians			
California tiger salamander *Ambystoma californiense*	FT, CSC	California endemic, a lowland species restricted to the grasslands and lowest foothill regions of Central and Northern California. Breeding habitats are vernal pools or other seasonal wetlands. During dry season, CTS travels up to 1.6 km to find small mammal burrows which it uses	May occur. Seasonal wetlands and small mammal burrows found in the Project vicinity provide suitable habitat for this species, although the Project Area is a few miles north of the nearest known population in San Mateo County.

		as aestivation habitat.	

Table A-2: Special-status Wildlife Species with Potential to Occur in the Project Vicinity, continued

Name	Status	Habitat	Potential to Occur
Amphibians, continued			
California red-legged frog *Rana aurora draytonii*	FT, CSC	Lowlands and foothills in or near permanent sources of deep water with dense, shrubby or emergent riparian vegetation. Requires 11-20 weeks of permanent water for larval development, must have access to aestivation habitat.	Known to occur in the Project Area
Foothill yellow-legged frog *Rana boylii*	CSC	Partly-shaded, low-gradient streams and riffles with a rocky substrate in a variety of habitats. Need at least some cobble-sized substrate for egg-laying. Need at least 15 weeks to attain metamorphosis.	Unlikely to occur. Small portions of the Project Area hold marginal habitat, however the Project vicinity is outside of the known range for the species.
Reptiles			
Loggerhead turtle *Caretta caretta*	FT	Adults occupy various habitats, from turbid bays to clear waters of reefs. Subadults occur mainly in near shore and estuarine waters. Hatchlings move directly to sea after hatching, often float in masses of sea plants Over continental shelf, and in bays, estuaries, lagoons, creeks, and mouths of rivers; mainly warm temperate and subtropical regions not far from shorelines	No potential to occur. No habitat and no access to reservoir.
Olive (or Pacific) Ridley sea turtle *Lepidochelys olivacea*	FT	Range in the Pacific Ocean includes the west coast of California southward to Chile Habitat is mainly protected, shallow, marine waters, including bays and lagoons, usually within 15 kilometers of mainland shores	No potential to occur. No habitat and no access to reservoir.
Leatherback turtle *Dermochelys coriacea*	FE	Marine; open ocean, often near edge of continental shelf; also seas, gulfs, bays, and estuaries. Mainly pelagic, seldom	No potential to occur. No habitat and no access to reservoir.

		approaching land except for nesting. Concentrates in summer in waters mostly 20-40 meters deep	

Table A-2: Special-status Wildlife Species with Potential to Occur in the Project Vicinity, continued

Name	Status	Habitat	Potential to Occur
Reptiles, continued			
Green turtle *Chelonia mydas* (inc. *agassizi*)	FT	Most commonly feeds in shallow, low-energy waters with abundant submerged vegetation. Migrates across open seas. Adults are tropical in distribution, whereas juveniles range into temperate waters. Coral reefs and rocky outcrops near feeding pastures often are used as resting areas. Inactive on the bottom in winter in the northern Gulf of California.	No potential to occur. No habitat and no access to reservoir.
Northwestern pond turtle *Clemmys marmorata marmorata*	CSC	Thoroughly aquatic: found in ponds, marshes, rivers, streams and irrigation ditches with aquatic vegetation. Need basking sites and suitable (sandy banks or grassy open fields) upland habitat for egg-laying.	Likely to occur. Suitable habitat abundant within Project Area and western pond turtles were observed during Project wildlife surveys.
Southwestern pond turtle *Clemmys marmorata pallida*	CSC	Inhabits permanent or nearly permanent bodies of water in many habitat types; below 6,000 feet in elevation. Require basking sites such as partially submerged logs, vegetation mats, or open mud banks. Need suitable nesting sites.	Likely to occur. Suitable habitat abundant within Project Area and western pond turtles were observed during Project wildlife surveys.
California horned lizard *Phrynosoma coronatum frontale*	CSC	Frequents a wide variety of habitats, most common in lowlands along sandy washes with scattered low bushes. Open areas for sunning, bushes for cover, patches of loose soil for burial, and abundant supply of ants and other insects.	Not likely to occur. has not been observed during herpetological surveys in the Project area.
San Francisco garter snake *Thamnophis sirtalis tetrataenia*	FE, CE	Vicinity of freshwater marshes, ponds and slow moving streams in San Mateo County and extreme northern Santa Cruz County. Prefers dense cover and water depths of at	Known to occur in the Project Area.

		least 1 foot. Upland areas near water also very important.	

Table A-2: Special-Status Wildlife Species with Potential to Occur in the Project Vicinity, continued

Name	Status	Habitat	Potential to Occur
Birds			
Tricolored blackbird *Agelaius tricolor*	CSC	(Nesting colony) highly colonial species, most numerous in Central Valley and vicinity; largely endemic to California. Requires open water, protected nesting substrate, and foraging area with insect prey within a few kilometers of the colony.	Known to occur. Observed during Project wildlife survey.
Bell's sage sparrow *Amphispiza belli belli*	CSC	(Nesting) Nests in chaparral dominated by fairly dense stands of chamise. Found in coastal sage scrub in south of range Nests located on the ground beneath a shrub or in a shrub 6 to 18 inches above ground. Territories about 50 yards apart	May occur. Suitable nesting habitat is present in the Project Area.
Western burrowing owl *Athene cunicularia hypugaea*	CSC	Found in a wide variety of arid and semi-arid environments. Nesting habitat consists of open areas with mammal burrows, ranging from native prairie to urban habitats. Burrows need to be located in well-drained, level to gently sloping areas characterized by sparse vegetation and bare ground.	May occur. Small mammal burrows are present in the Project vicinity, but only marginal habitat is present in the Project Area due to the proximity to standing water and severity of slope.
Marbled murrelet *Brachyramphus marmoratus*	FT, CE	(Nesting) Feeds near-shore on fish; nests along coast, in California from Half Moon Bay to Santa Cruz and from Eureka to Oregon Border. Nests high in old-growth redwood dominated forests, up to six miles inland, often in Douglas firs.	May occur. Potential nesting habitat is located near the Project Area, but these sites lie on the border of this species' known range. Possible foraging habitat is present in the Project vicinity.
Ferruginous hawk *Buteo regalis*	CSC	(Wintering) open grasslands, sagebrush flats, desert scrub, low foothills and fringes of pinyon-juniper. Habitats with abundant small mammals.	May occur. Suitable foraging habitat is present in the Project vicinity.

Table A-2: Special-Status Wildlife Species with Potential to Occur in the Project Vicinity, continued

Name	Status	Habitat	Potential to Occur
Birds, continued			
Vaux's swift *Chaetura vauxi*	CSC	(Nesting) natural cavities with vertical entranceways, such as hollow trees. (Foraging) open sky over woodlands, lakes, and rivers, where flying insects are abundant. Nesting habitat is forest, either coniferous or mixed, but primarily old growth with snags for nesting and roosting.	Known to occur. Observed during Project wildlife survey.
Western snowy plover *Charadrius alexandrinus nivosus*	FT, CSC	(Nesting) federal listing applies only to the Pacific coastal population. Sandy beaches, salt pond levees, and shores of large alkali lakes, needs sandy gravelly or friable soils for nesting.	Unlikely to occur. Although there are known populations in the region, habitat in the Project Area is marginal at best.
Black swift *Cypseloides niger*	CSC	(Nesting) Coastal belt of Santa Cruz and Monterey Co, Central and Southern Sierra Nevada; San Bernardino and San Jacinto Mtns. Breeds in small colonies on cliffs behind of adjacent to waterfalls in deep canyons and sea-bluffs above surf; forages widely.	Unlikely to occur. Possible foraging area in Project vicinity, however no suitable nesting habitat in the area.
Short-tailed albatross *Diomedea albatrus*	FE	Pelagic offshore sea birds. Vagrant birds are occasionally seen off the California coast. Breeds on two small Japanese islands in the western Pacific.	Unlikely to occur. No suitable habitat in Project vicinity.
American peregrine falcon *Falco peregrinus anatum*	FD, CE	(Nesting) near wetlands, lakes, rivers, or other water; on cliffs, banks, dunes, mounds; also, human-made structures. Nest consists of a scrape on a depression or ledge in an open site.	Unlikely to occur. No nesting habitat within the expected inundation zone, however suitable foraging resources are present in the Project Area.
Saltmarsh common	CSC	Resident of the San Francisco Bay region,	Known to occur. Observed during Project wildlife survey.

yellowthroat *Geothlypis trichas sinuosa*		in fresh and salt water marshes. Requires thick, continuous cover down to water surface for foraging, tall grasses, tule patches, willows for nesting.	

Table A-2: Special-Status Wildlife Species with Potential to Occur in the Project Vicinity, continued

Name	Status	Habitat	Potential to Occur
Birds, continued			
Bald eagle *Haliaeetus leucocephalus*	FT, CE	(Nesting and wintering) ocean shore, lake margins, and rivers for both nesting and wintering. Most nests within 1 mile of water. Roosts communally in winter. Nests in large, old-growth, or dominant live tree with open branches, especially ponderosa pine.	Unlikely to occur. Marginal foraging habitat is present in the Project Area.
Harlequin duck *Histrionicus histrionicus*	CSC	(Nesting) Breeds on west slope of the Sierra Nevada, nesting along shores of swift, shallow rivers Nest often built in recess, sheltered overhead by stream bank, rocks, woody debris, usually within 7 feet of water.	Unlikely to occur. No suitable habitat found within the Project vicinity.
Loggerhead shrike *Lanius ludovicianus*	CSC	(Nesting) broken woodlands, savannah, pinyon-juniper, Joshua tree, and riparian woodlands, desert oases, scrub and washes. Prefers open country for hunting, with perches for scanning, and fairly dense shrubs and brush for nesting	May occur. Riparian woodlands located within the Project Area provide suitable nesting habitat.
California black rail *Laterallus jamaicensis coturniculus*	CT	Mainly inhabits salt marshes bordering large bays. Occurs in tidal salt marsh heavily grown to pickleweed; also in fresh-water and brackish marshes, all at low elevation.	May occur. Fresh-water marshes are present in the Project Area and it is in relative proximity to large salt water marshes of the San Francisco Bay.
Alameda song sparrow *Melospiza melodia pusillula*	CSC	Resident of salt marshes bordering south arm of San Francisco Bay. Inhabits *Salicornia* marshes; nests low in *Grindelia* bushes (high enough to escape high tides) and in *Salicornia*.	Unlikely to occur. The Project Area does not provide suitable habitat for the species.
Long-billed curlew	CSC	(Nesting) breeds in upland shortgrass	May occur. Project Area is outside the nesting range of

Numenius americanus		prairies and wet meadows in northeastern California. Habitats on gravelly soils and gently rolling terrain are favored over others.	the species, but marginal winter foraging habitat is present.

Table A-2: Special-Status Wildlife Species with Potential to Occur in the Project Vicinity, continued

Name	Status	Habitat	Potential to Occur
Birds, continued			
Ashy storm-petrel *Oceanodroma homochroa*	CSC	(Rookery site) colonial nester on off-shore islands. Usually nests on driest part of islands. Forages over open ocean. Nest sites on islands are in crevices beneath loosely piled rocks or driftwood, or in caves.	Unlikely to occur. Project Area does not have suitable nesting or foraging habitat for this species.
California brown pelican *Pelecanus occidentalis californicus*	FE, CE	(Nesting colony) colonial nester on coastal islands just outside the surf line. Nests on coastal islands of small to moderate size which afford immunity from attack by ground-dwelling predators.	Unlikely to occur. Suitable habitat not present in Project vicinity.
Double-crested cormorant *Phalacrocorax auritus*	CSC	(Rookery site) colonial nester on coastal cliffs, offshore islands, and along lake margins in the interior of the state. Nests along coast on sequestered islets, usually on ground with sloping surface, or in tall trees along lake margins.	Known to occur. Observed during Project wildlife survey. Suitable nesting habitat present in Project Area.
California clapper rail *Rallus longirostris obsoletus*	FE, CE	Salt-water and brackish marshes traversed by tidal sloughs in the vicinity of San Francisco Bay. Associated with abundant growths of pickleweed, but feeds away from cover on invertebrates from mud-bottomed sloughs.	Unlikely to occur. Project Area does not provide suitable foraging habitat.
Bank swallow *Riparia riparia*	CT	(Nesting) colonial nester; nests primarily in riparian and other lowland habitats west of the desert. Requires vertical banks/cliffs with fine-textured/sandy soils near streams, rivers, lakes, ocean to dig nesting hole.	May occur. Potential nesting habitat observed Project vicinity.
Black skimmer *Rynchops niger*	CSC	The black skimmer nests on open sandy beaches, inlets, sandbars, offshore islands,	Unlikely to occur. Project Area does not include coastal or estuarine habitat.

		and dredge disposal islands that are sparsely vegetated. Black skimmers forage in shallow-water tidal creeks, inlets, and ponds. Similar coastal and estuarine habitats are used throughout the year.	

Table A-2: Special-Status Wildlife Species with Potential to Occur in the Project Vicinity, continued

Name	Status	Habitat	Potential to Occur
Birds, continued			
California least tern *Sterna antillarum browni*	FE, CE	(Nesting colony) Nests along the coast from San Francisco Bay south to northern Baja California.	May occur. Project Area found within species' known range, and may provide marginal foraging habitat.
Cooper's hawk *Accipiter cooperi*	CSC	Appears in most wooded areas of the state. Requires dense stands of live oak, riparian deciduous or other forest habitats near water when nesting.	May occur. Project Area contains suitable habitat and foraging resources.
Little willow flycatcher *Empidonax traillii brewsteri*	CE	Prefers moist shrubby areas that often include standing or running water. Habitat includes thickets of willows, along streams in broad valleys, in canyon bottoms, around mountain seepages, or at the margins of ponds and lakes.	Unlikely to occur. Project Area is outside the reported range of this species.
Osprey *Pandion haliaetus*	CSC	Occurs in ponderosa pine and mixed conifer habitats along seacoasts, lakes, and rivers. Foraging areas require large snags and open trees near large, clear, open waters.	Likely to occur. Project Area is within proximity of Osprey habitat, and reservoir has high potential for Osprey foraging.
Elegant tern *Sterna elegans*	CSC	(Nesting colony) only 3 known breeding colonies: San Diego Bay, Los Angeles Harbor and Bolsa Chica Ecological Reserve. Nests on open, sandy, undisturbed beaches and on salt-evaporating pond dikes (San Diego) in association with Caspian tern.	Unlikely to occur. Project Area is located outside of known nesting range and no suitable nesting habitat is present in the Project vicinity.

Table A-2: Special-Status Wildlife Species with Potential to Occur in the Project Vicinity, continued

Name	Status	Habitat	Potential to Occur
Mammals			
Steller (=northern) sea-lion *Eumetopias jubatus*	FT	Breeds on Ano Nuevo, San Miguel and Farallon Islands, Pt. St. George, and Sugarloaf. Hauls-out on islands and rocks. Needs haul-out and breeding sites with unrestricted access to water, near aquatic food supply and with no human disturbance.	No potential to occur. No habitat and no access to reservoir.
Guadalupe fur seal *Arctocephalus townsendi*	FT, CT	Breed on Isla De Guadalupe off of Mexico, occasionally found on San Miguel, San Nicolas, and San Clemente Islands. Prefer shallow, near shore island water, with cool and sheltered rocky areas for haul-outs.	No potential to occur. No habitat and no access to reservoir.
Sei whale *Balaenoptera borealis*	FE	Worldwide, but distribution and movements during much of year are poorly not well known. Coast of Mexico to Gulf of Alaska in the eastern North Pacific. Generally found in deep water; along edge of continental shelf and in open ocean.	No potential to occur. No habitat and no access to reservoir.
Blue whale *Balaenoptera musculus*	FE	Occurs throughout the world's oceans. Three major breeding groups: North Pacific, North Atlantic, and Antarctic, Seen with some regularity in deep coastal canyons off central and southern California Mainly pelagic; generally prefers cold waters and open seas, but young are born in warmer waters of lower latitudes.	No potential to occur. No habitat and no access to reservoir.
Finback (=fin) whale *Balaenoptera physalus*	FE	Worldwide in temperate and polar waters, in several distinct breeding stocks. In the eastern North Pacific, summers north to the Chukchi Sea, winters north to California Pelagic; usually found in largest numbers	No potential to occur. No habitat and no access to reservoir.

		25 miles or more from shore. In the western Atlantic, occurs mainly over continental shelf in summer, in water 50 to 100 fathoms deep.	

Table A-2: Special-Status Wildlife Species with Potential to Occur in the Project Vicinity, continued

Name	Status	Habitat	Potential to Occur
Mammals, continued			
Pacific western big-eared bat *Corynorhuinus* (=*Plecotus*) *townsendii townsendii*	CSC	Humid coastal regions of northern and central California. Roost in limestone caves, lava tubes, mines, buildings, etc. Will only roost in the open, hanging from walls and ceilings. Roosting sites limiting. Extremely sensitive to disturbance.	May occur. Anthropogenic features may serve as roosting habitat. Abundant foraging habitat is present in the Project Area.
Santa Cruz kangaroo rat *Dipodomys venustus venustus*	CSC	Silverleaf manzanita mixed chaparral in the Zayante Sand Hills ecosystem of the Santa Cruz Mountains. Needs soft-well drained sand.	Unlikely to occur. Chaparral habitat in the Project Area is poor/marginal and shoreline is primarily rocky along the Project Area.
Gray whale *Eschrichtius robustus*	FD, CE	Coastal waters of the North Pacific. In winter, occurs in coastal waters off Baja California, Sonora, and Sinaloa. Benthic occurring, mostly in coastal and shallow shelf waters. Young are born in lagoons and bays.	No potential to occur. No habitat and no access to reservoir.
Right whale *Eubalaena glacialis*	FE	North Pacific (Baja California to Bering Sea, and off the northeastern Asian coast south in winter to the Yellow Sea). Remaining North Pacific animals concentrated in relatively warm (10.4 C SST), shallow (50 to 80 meters deep), well-stratified water	No potential to occur. No habitat and no access to reservoir.
Greater western mastiff bat *Eumops perotis californicus*	CSC	Many open, semi-arid to arid habitats, including conifer and deciduous woodlands, coastal scrub, grasslands, chaparral etc Roosts in crevices in cliff faces, high buildings, trees and tunnels.	May occur. Anthropogenic features may serve as roosting habitat. Abundant foraging habitat present
San Francisco dusky-footed woodrat *Neotoma fuscipes annectens*	CSC	Forest habitats of moderate canopy and moderate to dense understory. May prefer chaparral and redwood habitats. Constructs	Likely to occur. Woodrat nests observed during Project wildlife survey.

		nests of shredded grass, leaves and other material. May be limited by availability of nest-building materials.	

Table A-2: Special-Status Wildlife Species with Potential to Occur in the Project Vicinity, continued

NAME	STATUS	HABITAT	POTENTIAL TO OCCUR
Mammals, continued			
Big free -tailed bat *Nyctinomops macrotis*	CSC	Low-lying arid areas in southern California. Need high cliffs or rocky outcrops for roosting sites. Feeds principally on large moths.	Unlikely to occur. Suitable foraging habitat is present, but Project Area located outside of the normal range for this species.
Sperm whale *Physeter catodon (=macrocephalus)*	FE	Throughout the world's oceans; adult females and young generally stay between 40 degrees N and 40 degrees S latitude. Pelagic, prefers deep water, sometimes found around islands or in shallow shelf waters	No potential to occur. No habitat and no access to reservoir.
Salt-marsh harvest mouse *Reithrodontomys raviventris*	FE, CE	Only in the saline emergent wetlands of San Francisco Bay and its tributaries. Pickleweed is primary habitat. Do not burrow, build loosely organized nests. Require higher areas for flood escape.	No potential to occur. Project Area does not have suitable habitat for this species
Salt marsh vagrant shrew *Sorex vagrans halicoetes*	CSC	Limited to the salt marshes of the south arm of San Francisco Bay. Tidal marshes that provide dense cover, abundant food (primarily invertebrates), suitable nesting sites, and fairly continuous ground moisture.	No potential to occur. Project Area does not have suitable habitat for this species.
American badger *Taxidea taxus*	CSC	Most abundant in drier open stages of most shrub, forest, and herbaceous habitats, with friable soils. Need sufficient food, friable soils and open, uncultivated ground. Prey on burrowing rodents. Dig burrows.	Limited potential to occur. Only marginal habitat available.

Sources: CDFG 2005, CDFG 2006b, CDFG 2006a, CDFG 2006b, USFWS 2005a, Zeiner et al. 1988; 1990a; and 1990b.

Codes

FC:	Federal Candidate for listing	CT:	State of California Threatened
FE:	Federally Endangered	CSC:	California Species of Concern
FT:	Federally listed as threatened	N:	North
FD:	Federal Delisted	S:	South
CE:	State of California Endangered		

Appendix B

California Natural Diversity Database Occurrences for the Project Quadrangles

Acanthomintha duttonii

San Mateo thorn-mint

Element Code: PDLAM01040

Status
Federal: Endangered
State: Endangered

NDDB Element Ranks
Global: G1
State: S1.1

Other Lists
CNPS List: 1B
R-E-D Code: 3-3-3

Habitat Associations
General: CHAPARRAL, VALLEY AND FOOTHILL GRASSLAND, COASTAL SCRUB.
Micro: EXTANT POPULATIONS ONLY KNOWN FROM VERY UNCOMMON SERPENTINITE VERTISOL CLAYS; IN RELATIVELY OPEN AREAS. 50-200M.

Occurrence No. 2 **Map Index:** 09268 **EO Index:** 18112
Occ Rank: None
Origin: Natural/Native occurrence
Presence: Extirpated
Trend: Unknown
Main Source: DUTTON & WALKER #3819 UCLA (HERB)

Dates Last Seen
Element: 1915-05-29
Site: 1915-05-29
Record Last Updated: 1997-02-06

Quad Summary: PALO ALTO (3712242/428B), WOODSIDE (3712243/429A)
County Summary: SAN MATEO

Lat/Long: 37.44826° / -122.23747°
UTM: Zone-10 N4144874 E567446
Radius: 1 mile
Elevation: 170 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT
Township: 05S
Range: 03W
Section: 31 **Qtr:** XX
Meridian: M

Location: NEAR THE MENLO GOLF CLUB (MENLO COUNTRY CLUB).
Ecological: SMALL AREA OF SANDY SOIL ON A HILLSIDE SLOPING TO THE SOUTH.
General: URBANIZATION EXTIRPATED THIS OCCURRENCE.
Owner/Manager: PVT

Occurrence No. 3 **Map Index:** 09217 **EO Index:** 18110
Occ Rank: None
Origin: Natural/Native occurrence
Presence: Extirpated
Trend: Unknown
Main Source: ROSE, L. #36303 CAS (HERB)

Dates Last Seen
Element: 1940-05-15
Site: 1940-05-15
Record Last Updated: 1995-11-15

Quad Summary: PALO ALTO (3712242/428B), WOODSIDE (3712243/429A)
County Summary: SAN MATEO

Lat/Long: 37.45938° / -122.26192°
UTM: Zone-10 N4146090 E565275
Radius: 1 mile
Elevation: 480 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT
Township: 05S
Range: 04W
Section: 35 **Qtr:** XX
Meridian: M

Location: EMERALD LAKE WEST OF REDWOOD CITY.
Ecological: DRY RAIN POOL ON SERPENTINE BALD AT EDGE OF CHAPARRAL.
General: EXTIRPATED ACCORDING TO SUSAN SOMMERS, 1979.
Owner/Manager: PVT

Occurrence No. 4 **Map Index:** 09003 **EO Index:** 18109
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: HECKARD & THOMAS #2903 JEPS (HERB)

Dates Last Seen
Element: 1972-05-16
Site: 1989-06-08
Record Last Updated: 1998-04-09

Quad Summary: SAN MATEO (3712253/448D)
County Summary: SAN MATEO

Lat/Long: 37.50548° / -122.33941°
UTM: Zone-10 N4151154 E558385
Radius: 1/5 mile
Elevation: 325 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT
Township: 05S
Range: 04W
Section: 7 **Qtr:** XX
Meridian: M

Location: EAST SIDE UPPER CRYSTAL SPRINGS RESERVOIR BELOW HIGHWAY INTERCHANGE WEST OF CANADA RD.
Location Detail:ALONG EAST SIDE OF RESERVOIR. MANAGED BY SAN FRANCISCO WATER DEPARTMENT.
Ecological: SERPENTINE SLOPE WITH STIPA SP., FRITILLARIA LILIACEA, ERYSIMUM FRANCISCANUM VAR. FRANCISCANUM.
Threat: SOME NATIVE VEGETATION IS COMING BACK, BUT STILL THREAT OF INVASIVE WEEDY SPECIES IN THIS AREA.
General: THIS IS THE SITE OF A 1972 COLLECTION. POPULATION MAY HAVE BEEN DESTROYED BY THE CONSTRUCTION OF THE 280 FREEWAY. SOME SUITABLE HABITAT STILL EXISTS ACC TO PARTICIPANTS AT 1997 RECOVERY WORKSHOP; EXTENSIVE SURVEYS NEEDED.
Owner/Manager: SFO CITY/COUNTY(MGMT BY SFPUC)

Acanthomintha duttonii

San Mateo thorn-mint

Element Code: PDLAM01040

Status		NDDB Element Ranks		Other Lists	
Federal:	Endangered	**Global:**	G1	**CNPS List:**	1B
State:	Endangered	**State:**	S1.1	**R-E-D Code:**	3-3-3

Habitat Associations

General: CHAPARRAL, VALLEY AND FOOTHILL GRASSLAND, COASTAL SCRUB.

Micro: EXTANT POPULATIONS ONLY KNOWN FROM VERY UNCOMMON SERPENTINITE VERTISOL CLAYS; IN RELATIVELY OPEN AREAS. 50-200M.

Occurrence No. 5 **Map Index:** 09185 **EO Index:** 18108

Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Fluctuating
Main Source: PAVLIK, B. ET AL 1992 (LIT)

Dates Last Seen
Element: 1997-04-17
Site: 1997-04-17

Record Last Updated: 1998-04-09

Quad Summary: WOODSIDE (3712243/429A)
County Summary: SAN MATEO

Lat/Long: 37.46437° / -122.27525°
UTM: Zone-10 N4146635 E564091
Radius: 1/5 mile
Elevation: 600 ft

Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT

Township: 05S
Range: 04W
Section: 26 **Qtr:** XX
Meridian: M

Location: EDGEWOOD COUNTY PARK, ABOUT 1.0 AIR MILE WEST OF REDWOOD CITY, HILLCREST WAY.

Location Detail: NUTLETS COLLECTED FROM THIS SITE & INTRODUCED TO PULGAS RIDGE SITE (OCC 7). MORE SITE INFO AT CNDDB (PAVLIK & ESPELAND 1992-94). A SMALL SUBPOP. ("COLONY 1") WAS DISCOVERED JUST 160 PACES DOWNSLOPE FROM MAIN POP. 75-220 PLANTS 1993-94.

Ecological: PLANTS ON SERPENTINE BALD AT EDGE OF CHAPARRAL IN GRASSLAND. ASSOCIATED WITH NASSELLA PULCHRA, HEMIZONIA LUZULAEFOLIA, CLARKIA RUBICUNDA, SIDALCEA DIPLOSCYPHA, AVENA, LAYIA, CHLOROGALUM, AND LOLIUM MULTIFLORUM.

Threat: DEVELOPMENT UPSLOPE FROM SITE, PAST ORV DAMAGE, VANDALISM, AND NON-ORV RECREATION THREATEN.

General: LESS THAN 1000 PLANTS IN 1981, LESS THAN 500 IN `84, LESS THAN 3000 IN `86, 3000 IN `88, 13,000 IN `90, 9000 IN `91, 18,772 IN `92, 36,280 IN `93, 53,136 IN `94. MANY HISTORICAL COLLECTIONS FROM THIS SITE. MAP DETAIL NEEDED.

Owner/Manager: SMT COUNTY

Occurrence No. 6 **Map Index:** 09130 **EO Index:** 17716

Occ Rank: Excellent
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: MCCARTEN, N. 1987 (OBS)

Dates Last Seen
Element: 1995-05-20
Site: 1995-05-20

Record Last Updated: 1998-04-09

Quad Summary: WOODSIDE (3712243/429A)
County Summary: SAN MATEO

Lat/Long: 37.46464° / -122.29352°
UTM: Zone-10 N4146653 E562475
Area: 27.1 ac
Elevation: 520 ft

Mapping PrecisionSPECIFIC
Symbol Type:POLYGON

Township: 05S
Range: 04W
Section: 27 **Qtr:** XX
Meridian: M

Location: "THE TRIANGLE": ABOUT 400-500 FEET SOUTH OF EDGEWOOD ROAD AND I-280 OVERPASS, WEST OF REDWOOD CITY.

Location Detail: MANAGED BY SAN FRANCISCO WATER DEPARTMENT. CNDDB HAS WALKING DIRECTIONS TO THIS SITE PROVIDED BY D. STEECK.

Ecological: ON SERPENTINE BUNCHGRASS GRASSLAND WITH SITANION JUBATUM. OTHER RARE PLANTS IN THE VICINITY: PENTACHAETA BELLIDIFLORA, CIRSIUM FONTINALE VAR. FONTINALE.

Threat: DEVELOPMENT, GOLF COURSE PROPOSED FOR THE DOWNSLOPE PORTION OF THE TRIANGLE.

General: LESS THAN 20 PLANTS REPORTED IN 1987, 34 IN 1994, 23 IN 1995 IN AN AREA SMALLER THAN ONE SQUARE FOOT. SFWD CURRENTLY PROTECTING AGAINST USE OF PESTICIDES AND SITE IS FENCED TO AVOID TRAMPLING.

Owner/Manager: SFO CITY/COUNTY(MGMT BY SFPUC)

Acanthomintha duttonii

San Mateo thorn-mint

Element Code: PDLAM01040

Status

Federal: Endangered
State: Endangered

NDDB Element Ranks

Global: G1
State: S1.1

Other Lists

CNPS List: 1B
R-E-D Code: 3-3-3

Habitat Associations

General: CHAPARRAL, VALLEY AND FOOTHILL GRASSLAND, COASTAL SCRUB.
Micro: EXTANT POPULATIONS ONLY KNOWN FROM VERY UNCOMMON SERPENTINITE VERTISOL CLAYS; IN RELATIVELY OPEN AREAS. 50-200M.

Occurrence No. 7
Map Index: 28886
EO Index: 30404
Occ Rank: Unknown
Origin: Introduced Back into Native Hab./Range
Presence: Presumed Extant
Trend: Unknown
Main Source: PAVLIK, B. & E. ESPELAND 1993 (LIT)

Dates Last Seen

Element: 1994-06-04
Site: 1994-06-04
Record Last Updated: 1998-04-09

Quad Summary: SAN MATEO (3712253/448D)
County Summary: SAN MATEO

Lat/Long: 37.51752° / -122.35060°
UTM: Zone-10 N4152483 E557387
Radius: 80 meters
Elevation: 550 ft
Mapping PrecisionSPECIFIC
Symbol Type:POINT
Township: 05S
Range: 04W
Section: 7
Qtr: XX
Meridian: M

Location: PULGAS RIDGE; 0.4 MI S OF HIGHLANDS SCHOOL.

Location Detail: POPULATION REPORTED AT 1997 RECOVERY WORKSHOP TO BE DECLINING SINCE SEED QUIT BEING ADDED IN 1995. THOUGH PRECARIOUS, POPULATION IS REPRODUCING ON ITS OWN.

Ecological: 2 SUBPOPULATIONS: ONE ON S-FACING SLOPE AND ONE ON N-FACING SLOPE.

Threat: PREDATION BY MICROHERBIVORES (INSECTS, SNAILS, ETC) NOTED AS A STRESS TO PLANTS. DOG TRACKS THROUGH SITE.

General: 1176 NUTLETS (FROM OCC #5-EDGEWOOD PARK) SOWN HERE ON 9/9/91, 315 SEEDLINGS COUNTED IN 1992 (JANUARY-JUNE GROWING SEASON). SITE ENHANCED (SEEDS (ADDED) 10/92, 11/93, 1994, AND 1995. 181 PLANTS IN `93, 158 IN `94.

Owner/Manager: SAN FRANCISCO PUC

Allium peninsulare var. franciscanum

Franciscan onion

Element Code: PMLIL021R1

Status		NDDB Element Ranks		Other Lists	
Federal:	None	**Global:**	G5T2	**CNPS List:**	1B
State:	None	**State:**	S2.2	**R-E-D Code:**	2-2-3

Habitat Associations

General: CISMONTANE WOODLAND, VALLEY AND FOOTHILL GRASSLAND.

Micro: CLAY SOILS; OFTEN ON SERPENTINE. DRY HILLSIDES. 100-300M.

Occurrence No. 3 **Map Index:** 45121 **EO Index:** 45121

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: ABRAMS #2411 DS, NY (HERB)

Dates Last Seen
Element: 1902-05-04
Site: 1902-05-04

Record Last Updated: 2001-03-26

Quad Summary: PALO ALTO (3712242/428B), WOODSIDE (3712243/429A)

County Summary: SAN MATEO

Lat/Long: 37.43043° / -122.25261°
UTM: Zone-10 N4142885 E566123
Radius: 1 mile
Elevation: 380 ft

Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT

Township: 06S
Range: 04W
Section: 12 **Qtr:** XX
Meridian: M

Location: WOODSIDE.

General: NEEDS FIELDWORK.

Owner/Manager: UNKNOWN

Occurrence No. 5 **Map Index:** 45124 **EO Index:** 45124

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: C.F.B. #809 UC #142808 (HERB)

Dates Last Seen
Element: 1902-05-10
Site: 1902-05-10

Record Last Updated: 2001-04-07

Quad Summary: WOODSIDE (3712243/429A), SAN MATEO (3712253/448D)

County Summary: SAN MATEO

Lat/Long: 37.49700° / -122.33628°
UTM: Zone-10 N4150215 E558668
Radius: 1 mile
Elevation: 300 ft

Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT

Township: 05S
Range: 04W
Section: 18 **Qtr:** XX
Meridian: M

Location: CRYSTAL SPRINGS LAKE.

Location Detail:MAPPED TO INCLUDE CRYSTAL SPRINGS RESERVOIR BY CNDDB.

Ecological: FOUND IN VERY HARD ROCKY PLACES ALONG THE RIDGES.

General: NEEDS FIELDWORK.

Owner/Manager: SFO CITY/COUNTY(MGMT BY SFPUC)

Occurrence No. 6 **Map Index:** 45125 **EO Index:** 45125

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: EASTWOOD, A. SN UC #142741 (HERB)

Dates Last Seen
Element: 1895-05-31
Site: 1895-05-31

Record Last Updated: 2001-03-26

Quad Summary: SAN MATEO (3712253/448D), MONTARA MOUNTAIN (3712254/448C)

County Summary: SAN MATEO

Lat/Long: 37.58440° / -122.36528°
UTM: Zone-10 N4159894 E556040
Radius: 1 mile
Elevation: 30 ft

Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT

Township: 04S
Range: 05W
Section: 13 **Qtr:** XX
Meridian: M

Location: BURLINGAME.

General: NEEDS FIELDWORK, ONLY SOURCE OF INFORMATION IS 1895 COLLECTION BY EASTWOOD.

Owner/Manager: UNKNOWN

Allium peninsulare var. franciscanum

Franciscan onion

Element Code: PMLIL021R1

Status
Federal: None
State: None

NDDB Element Ranks
Global: G5T2
State: S2.2

Other Lists
CNPS List: 1B
R-E-D Code: 2-2-3

Habitat Associations
General: CISMONTANE WOODLAND, VALLEY AND FOOTHILL GRASSLAND.
Micro: CLAY SOILS; OFTEN ON SERPENTINE. DRY HILLSIDES. 100-300M.

Occurrence No. 7 **Map Index:** 43750 **EO Index:** 45126
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: ELMER, A. #4595 UC #311526 (HERB)

Dates Last Seen
Element: 1903-06-XX
Site: 1903-06-XX
Record Last Updated: 2001-03-26

Quad Summary: SAN MATEO (3712253/448D)
County Summary: SAN MATEO

Lat/Long: 37.56330° / -122.32206°
UTM: Zone-10 N4157580 E559872
Radius: 1 mile
Elevation: 22 ft
Mapping Precision NON-SPECIFIC
Symbol Type: POINT
Township: 04S
Range: 04W
Section: 20 **Qtr:** XX
Meridian: M

Location: SAN MATEO
General: NEEDS FIELDWORK, ONLY SOURCE OF INFORMATION IS 1903 COLLECTION BY ELMER.
Owner/Manager: UNKNOWN

Occurrence No. 8 **Map Index:** 45127 **EO Index:** 45127
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: BREEDLOVE, D. #4942 JEPS #33718 (HERB)

Dates Last Seen
Element: 1963-05-13
Site: 1963-05-13
Record Last Updated: 2001-04-07

Quad Summary: SAN MATEO (3712253/448D)
County Summary: SAN MATEO

Lat/Long: 37.53268° / -122.35018°
UTM: Zone-10 N4154165 E557412
Radius: 1/10 mile
Elevation: 125 ft
Mapping Precision NON-SPECIFIC
Symbol Type: POINT
Township: 05S
Range: 04W
Section: 06 **Qtr:** XX
Meridian: M

Location: 4 KM W OF SAN MATEO, SE CORNER OF JUNCTION OF CRYSTAL SPRINGS ROAD WITH POLHEMUS ROAD.
Ecological: FOUND ON GRASSY SLOPE.
General: NEEDS FIELDWORK.
Owner/Manager: UNKNOWN

Occurrence No. 9 **Map Index:** 45128 **EO Index:** 45128
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: SCHREIBER, B. #309 UC #615425 (HERB)

Dates Last Seen
Element: 1932-05-29
Site: 1932-05-29
Record Last Updated: 2001-03-26

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

Lat/Long: 37.56192° / -122.43556°
UTM: Zone-10 N4157360 E549849
Radius: 1 mile
Elevation: 1,150 ft
Mapping Precision NON-SPECIFIC
Symbol Type: POINT
Township: 04S
Range: 05W
Section: 29 **Qtr:** XX
Meridian: M

Location: SPRING VALLEY WATER COMPANY ROAD.
Location Detail: EXACT LOCATION UNKNOWN, MAPPED TO INCLUDE UNNAMED ROAD ON SPRING VALLEY RIDGE BY CNDDB.
Ecological: DAMP SLOPE.
General: NEEDS FIELDWORK, LOCATION INFORMATION IS VAGUE.
Owner/Manager: UNKNOWN

Ambystoma californiense

California tiger salamander

Element Code: AAAAA01180

Status		NDDB Element Ranks		Other Lists	
Federal:	Threatened	**Global:**	G2G3	**CDFG Status:**	SC
State:	None	**State:**	S2S3		

Habitat Associations

General: CENTRAL VALLY DPS LISTED AS THREATENED. SANTA BARBARA & SONOMA COUNTY DPS LISTED AS ENDANGERED.

Micro: NEED UNDERGROUND REFUGES, ESPECIALLY GROUND SQUIRREL BURROWS & VERNAL POOLS OR OTHER SEASONAL WATER SOURCES FOR BREEDING

Occurrence No. 545 **Map Index:** 45865 **EO Index:** 45865

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: CAL ACADEMY OF SCIENCES 1962 (MUS)

Dates Last Seen
Element: 1962-10-14
Site: 1962-10-14

Record Last Updated: 2001-09-07

Quad Summary: WOODSIDE (3712243/429A)

County Summary: SAN MATEO

Lat/Long: 37.43386° / -122.26543°
UTM: Zone-10 N4143257 E564986
Radius: 80 meters
Elevation: 400 ft

Mapping PrecisionSPECIFIC
Symbol Type:POINT

Township: 06S
Range: 04W
Section: 02 **Qtr:** XX
Meridian: M

Location: NW OF WOODSIDE.

Location Detail:FOUND AT 368 ALBION AVE.

General: 14 OCT 1962: CAS# 197631, JUVENILE. SVL, 64MM.

Owner/Manager: UNKNOWN

Amsinckia lunaris

bent-flowered fiddleneck

Element Code: PDBOR01070

Status		NDDB Element Ranks		Other Lists	
Federal:	None	**Global:**	G2	**CNPS List:**	1B
State:	None	**State:**	S2.2	**R-E-D Code:**	2-2-3

Habitat Associations

General: CISMONTANE WOODLAND, VALLEY AND FOOTHILL GRASSLAND.

Micro: 50-500M.

Occurrence No. 5 **Map Index:** 49037 **EO Index:** 49037

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: TAYLOR, D. #14276B JEPS #90282 (HERB)

Dates Last Seen
Element: 1994-05-10
Site: 1994-05-10

Record Last Updated: 2002-10-21

Quad Summary: SAN MATEO (3712253/448D)

County Summary: SAN MATEO

Lat/Long: 37.53701° / -122.34967°
UTM: Zone-10 N4154646 E557454
Area: 126.1 ac
Elevation: 220 ft

Mapping PrecisionNON-SPECIFIC
Symbol Type:POLYGON

Township: 04S
Range: 04W
Section: 31 **Qtr:** XX
Meridian: M

Location: 0.3 MILES EAST OF JUNCTION OF TARTAN TRAIL AND CRYSTAL SPRINGS ROAD, HILLSBOROUGH.

Location Detail:3 COLLECTIONS MAPPED TOGETHER GENERALLY ALONG CRYSTAL SPRINGS ROAD. WHERE IS POPULATION EXACTLY?

Ecological: IN SHADED UNDERSTORY ON STEEP NORTH-FACING SLOPE.

General: TYPE LOCALITY. COLLECTIONS FROM "1.7 MI BELOW JCT TO SKYLINE" FROM 1953 (G. NEWCOMB #116), AND "3 MILES BEYOND SAN MATEO...ON THE HALF MOON BAY ROAD" FROM 1907 (A. HELLER #8555, TYPE) ALSO ATTRIBUTED TO THIS SITE. NEEDS FIELDWORK.

Owner/Manager: UNKNOWN

Arctostaphylos andersonii

Santa Cruz manzanita
Element Code: PDERI04030

Status
Federal: None
State: None

NDDB Element Ranks
Global: G2
State: S2?

Other Lists
CNPS List: 1B
R-E-D Code: 2-2-3

Habitat Associations
General: BROADLEAVED UPLAND FOREST, CHAPARRAL, NORTH COAST CONIFEROUS FOREST.
Micro: OPEN SITES, REDWOOD FOREST. 180-800M.

Occurrence No. 10 **Map Index:** 26628 **EO Index:** 1304
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: DALY, J. #175 JEPS #48587 (HERB)

Dates Last Seen
Element: 1934-XX-XX
Site: 1934-XX-XX
Record Last Updated: 1995-12-18

Quad Summary: LA HONDA (3712233/429D), WOODSIDE (3712243/429A)
County Summary: SAN MATEO

Lat/Long: 37.35277° / -122.27561°
UTM: Zone-10 N4134253 E564154
Area: 737.7 ac
Elevation: 1,000 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POLYGON
Township: 07S
Range: 04W
Section: 2 **Qtr:** XX
Meridian: M

Location: MIDDLE LA HONDA CANYON, SAN GREGORIO WATERSHED, SANTA CRUZ MOUNTAINS.

Location Detail:EXACT SITE UNKNOWN; MAPPED BY CNDDB ALONG LA HONDA CREEK FROM TOWN OF LA HONDA NORTH TO SKY LONDA.

Ecological: IN CHAPARRAL OR RARELY UNDER BROADLEAVED TREES.

General: ONLY SOURCE OF INFORMATION FOR THIS SITE IS 1934 COLLECTION BY DALY.

Owner/Manager: UNKNOWN

Occurrence No. 11 **Map Index:** 26629 **EO Index:** 1416
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: WALLACE, G. SN UC #1424961 (HERB)

Dates Last Seen
Element: 1974-12-28
Site: 1974-12-28
Record Last Updated: 1996-02-19

Quad Summary: WOODSIDE (3712243/429A)
County Summary: SAN MATEO

Lat/Long: 37.45345° / -122.34021°
UTM: Zone-10 N4145381 E558355
Area: 113.4 ac
Elevation: 2,100 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POLYGON
Township: 05S
Range: 04W
Section: 31 **Qtr:** E
Meridian: M

Location: SKYLINE BLVD, 2.8 MILES NORTH OF KINGS MOUNTAIN ROAD, SOUTH OF UPPER CRYSTAL SPRINGS RESERVOIR, SANTA CRUZ MOUNTAINS.

Location Detail:ACROSS THE ROAD FROM FARWELLS RHODODENDRON NURSERY. COLLECTIONS FROM "SUMMIT OF KINGS MOUNTAIN" ALSO ATTRIBUTED TO THIS SITE.

Ecological: WITHIN FOG BELT. ASSOCIATED WITH LITHOCARPUS, SEQUOIA, PSEUDOTSUGA, AND ARBUTUS. SOIL RICH WITH HUMUS.

General: REPORTED FROM COLLECTIONS BY WALLACE SN (UC #1424961) IN 1974, NELSON SN (UC #1543114) IN 1938, AND LEE #1432 (JEPS #79444).

Owner/Manager: UNKNOWN

Occurrence No. 12 **Map Index:** 26630 **EO Index:** 22959
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: LEE, E. #1736 JEPS #78657 (HERB)

Dates Last Seen
Element: 1936-01-26
Site: 1936-01-26
Record Last Updated: 1995-11-09

Quad Summary: WOODSIDE (3712243/429A)
County Summary: SAN MATEO

Lat/Long: 37.42599° / -122.31211°
UTM: Zone-10 N4142352 E560862
Radius: 1/5 mile
Elevation: 2,000 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT
Township: 06S
Range: 04W
Section: 09 **Qtr:** XX
Meridian: M

Location: JUNCTION OF KINGS MOUNTAIN ROAD AND SKYLINE BLVD, SUMMIT OF CAHILL RIDGE.

Location Detail:COLLECTION FROM "KINGS MOUNTAIN ROAD, 4.7 MILES FROM WOODSIDE, EAST SIDE OF CAHILL RIDGE" IS ALSO ATTRIBUTED TO THIS SITE. THIS COLLECTION WAS PROBABLY MADE VERY CLOSE TO THE JUNCTION WITH SKYLINE BLVD.

Ecological: CHAPARRAL.

General: SITE KNOWN FROM TWO COLLECTIONS ON SAME DATE IN 1936 BY LEE; #1735, 1736 (JEPS #78656, 78657).

Owner/Manager: UNKNOWN

Arctostaphylos andersonii

Santa Cruz manzanita

Element Code: PDERI04030

Status

Federal: None
State: None

NDDB Element Ranks

Global: G2
State: S2?

Other Lists

CNPS List: 1B
R-E-D Code: 2-2-3

Habitat Associations

General: BROADLEAVED UPLAND FOREST, CHAPARRAL, NORTH COAST CONIFEROUS FOREST.
Micro: OPEN SITES, REDWOOD FOREST. 180-800M.

Occurrence No. 44 **Map Index:** 64043 **EO Index:** 64138
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: GANKIN, R. #384 DAV #50292 (HERB)

Dates Last Seen

Element: 1965-01-27
Site: 1965-01-27

Record Last Updated: 2006-02-23

Quad Summary: WOODSIDE (3712243/429A)
County Summary: SAN MATEO

Lat/Long: 37.38920° / -122.27946°
UTM: Zone-10 N4138293 E563782
Area: 73.7 ac
Elevation:
Mapping Precision NON-SPECIFIC
Symbol Type: POLYGON
Township: 06S
Range: 04W
Section: 22 **Qtr:** SE
Meridian: M

Location: ON STATE HIGHWAY 35 (SKYLINE BLVD) 1.1 MI NORTH OF JUNCTION WITH HIGHWAY 84; SOUTHWEST OF WUNDERLICH COUNTY PARK.

Location Detail: LARGE SHRUB, HANGING OVER ROAD.

Threat: ROAD WIDENING AND MAINTENENCE.

General: 1965 GANKIN COLLECTION IS THE ONLY SOURCE FOR THIS SITE. NEEDS FIELDWORK.

Owner/Manager: UNKNOWN

Arctostaphylos montaraensis

Montara manzanita

Element Code: PDERI040L2

Status

Federal: None
State: None

NDDB Element Ranks

Global: G2
State: S2.2

Other Lists

CNPS List: 1B
R-E-D Code: 3-2-3

Habitat Associations

General: CHAPARRAL, COASTAL SCRUB.
Micro: SLOPES AND RIDGES. 150-500M.

Occurrence No. 1 **Map Index:** 08780 **EO Index:** 20211

Dates Last Seen
Element: 1991-07-17
Site: 1991-07-17

Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: CORELLI, T. 1991 (OBS)

Record Last Updated: 2006-02-24

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

Lat/Long: 37.54462° / -122.43171°
UTM: Zone-10 N4155443 E550201
Area: 6.7 ac
Elevation: 1,250 ft
Mapping PrecisionSPECIFIC
Symbol Type:POLYGON
Township: 04S
Range: 05W
Section: 32 **Qtr:** NE
Meridian: M

Location: MONTARA MOUNTAIN, 1 MILE WEST OF PILARCITOS DAM, SOUTH OF PILARCITOS LAKE.

Location Detail: WEST OF ROAD FROM PILARCITOS DAM TO MONTARA MOUNTAIN. MAPPED WITHIN THE W 1/2 NE 1/4 SECTION 32.

Ecological: NORTHERN MARITIME CHAPARRAL. ASSOCIATED WITH BACCHARIS PILULARIS, CEANOTHUS THYRSIFLORUS, VACCINIUM OVATUM, DIRCA OCCIDENTALIS.

General: SEVERAL SHRUBS SEEN IN 1979. 4 SHRUBS SEEN IN 1991; ALL MATURE PLANTS. VERY SMALL COLONY AT EDGE OF HABITAT. RARE DIRCA OCCIDENTALIS ALSO OCCURS AT THIS LOCATION. 1893 BLAKE AND DAVY COLLECTIONS "PILARCITOS LAKE" ATTRIBUTED TO THIS SITE.

Owner/Manager: SAN FRANCISCO PUC

Occurrence No. 2 **Map Index:** 08653 **EO Index:** 14057

Dates Last Seen
Element: 1995-03-XX
Site: 1995-03-XX

Occ Rank: Excellent
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: GANKIN, R. 1978 (MAP)

Record Last Updated: 1999-11-03

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

Lat/Long: 37.56874° / -122.48125°
UTM: Zone-10 N4158094 E545810
Area: 365.6 ac
Elevation: 1,000 ft
Mapping PrecisionSPECIFIC
Symbol Type:POLYGON
Township: 04S
Range: 06W
Section: 23 **Qtr:** XX
Meridian: M

Location: NORTH SIDE OF MONTARA MOUNTAIN, BETWEEN OLD SAN PEDRO ROAD AND MIDDLE FORK SAN PEDRO CREEK, SOUTH OF SAN FRANCISCO.

Location Detail: 9 COLONIES. 3 WESTERN COLONIES (INCL.CNPS 2F) WEST OF BM 924, 2E:NORTH OF PEAK MTN, 2D:WEST OF S FORK SAN PEDRO CR., 2C:BETWEEN S AND M FORKS SAN PEDRO CR., 2 SMALL COLONIES ALONG S FORK SAN PEDRO CR, LARGE SE COLONY SOUTH OF WHITING RIDGE.

Ecological: MANZANITA AND NORTHERN MARITIME CHAPARRAL. COLONIES SEPARATED BY NORTHERN COASTAL SCRUB. ASSOCIATED WITH BACCHARIS PILULARIS, CEANOTHUS THYRSIFLORUS, MIMULUS AURANTIACUS, GARRY ELLIPTICA, GAULTHERIA SHALLON, VACCINIUM OVATUM, ET AL.

Threat: EROSION FROM POTENTIAL FOOT TRAFFIC, FIRE SUPPRESION. PROPOSED RIDGE-TOP TRAIL WOULD IMPACT SE COLONY.

General: 400 PLANTS SEEN AT SOUTHEASTERN COLONY IN 1991. MORE THAN 400 PLANTS SEEN AT FAR WESTERN COLONIES IN 1995. 1989 AND 1992 COLLECTIONS BY TAYLOR AT MONTARA MOUNTAIN ATTRIBUTED TO THIS SITE.

Owner/Manager: SMT COUNTY, PVT

Arctostaphylos montaraensis

Montara manzanita

Element Code: PDERI040L2

Status		NDDB Element Ranks		Other Lists	
Federal:	None	**Global:**	G2	**CNPS List:**	1B
State:	None	**State:**	S2.2	**R-E-D Code:**	3-2-3

Habitat Associations

General: CHAPARRAL, COASTAL SCRUB.

Micro: SLOPES AND RIDGES. 150-500M.

Occurrence No. 6 **Map Index:** 08717 **EO Index:** 20212

Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: CORELLI, T. 1991 (OBS)

Dates Last Seen
Element: 1991-07-19
Site: 1991-07-19

Record Last Updated: 1999-10-28

Quad Summary: MONTARA MOUNTAIN (3712254/448C)

County Summary: SAN MATEO

Lat/Long: 37.54858° / -122.44922°
UTM: Zone-10 N4155873 E548652
Area: 89.5 ac
Elevation: 1,500 ft

Mapping PrecisionSPECIFIC
Symbol Type:POLYGON

Township: 04S
Range: 05W
Section: 31 **Qtr:** NW
Meridian: M

Location: MONTARA MOUNTAIN, ABOUT 1.5 AIRMILE WEST OF PILARCITOS DAM, SOUTH OF SAN FRANCISCO.

Location Detail: ALONG BOTH SIDES OF ROAD FROM PILARCITOS DAM TO MONTARA MOUNTAIN. COLONY BEGINS ABOUT 0.5 MILE NORTHWEST OF JUNCTION WITH ROAD TO SCARPER PEAK AND EXTENDS ALONG ROAD TO THE NORTHWEST FOR ABOUT 0.75 MILE.

Ecological: NORTHERN MARITIME CHAPARRAL. ASSOCIATED WITH BACCHARIS PILULARIS, CEANOTHUS THYRSIFLORUS, MIMULUS AURANTIACUS, GARRYA ELLIPTICA, GAULTHERIA SHALLON, VACCINIUM OVATUM. ON DECOMPOSED GRANITE.

Threat: COLONY DISSECTED BY ROAD. RIDGETOP TRAIL MAY IMPACT THIS AREA, PAMPAS GRASS GROWING ALONG ROAD.

General: SEVERAL SHRUBS SEEN IN 1978. 75 PLANTS SEEN IN 1991.

Owner/Manager: SAN FRANCISCO PUC

Arctostaphylos regismontana

Kings Mountain manzanita

Element Code: PDERI041C0

Status
Federal: None
State: None

NDDB Element Ranks
Global: G2
State: S2.2

Other Lists
CNPS List: 1B
R-E-D Code: 2-2-3

Habitat Associations
General: BROADLEAVED UPLAND FOREST, CHAPARRAL, NORTH COAST CONIFEROUS FOREST.
Micro: GRANITIC OR SANDSTONE OUTCROPS. 305-730M.

Occurrence No. 4 **Map Index:** 56330 **EO Index:** 56346
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: WOLF, C. #1811 UC (HERB)

Dates Last Seen
Element: 1930-11-06
Site: 1930-11-06
Record Last Updated: 2004-08-06

Quad Summary: WOODSIDE (3712243/429A)
County Summary: SAN MATEO

Lat/Long: 37.44693° / -122.33324°
UTM: Zone-10 N4144663 E558976
Area: 62.4 ac
Elevation: 2,100 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POLYGON
Township: 06S
Range: 04W
Section: 05 **Qtr:** XX
Meridian: M

Location: SKYLINE BLVD. 2.0 MILES N OF KINGS MOUNTAIN SUMMIT, SANTA CRUZ MOUNTAINS.

Location Detail: EXACT LOCATION UNKNOWN. MAPPED AS BEST GUESS BY CNDDB, ALONG SKYLINE BLVD., 2.0 MILES N OF THE INTERSECTION OF KINGS MOUNTAIN ROAD AND SKYLINE BLVD.

General: 1936 COLLECTION BY BELSHAW "KINGS MOUNTAIN ROAD, 6.0 MILES W OF WOODSIDE" ATTRIBUTED TO THIS SITE. UNKNOWN NUMBER OF PLANTS SEEN IN 1930 AND 1936. NEEDS FIELDWORK.

Owner/Manager: UNKNOWN

Occurrence No. 5 **Map Index:** 26630 **EO Index:** 56345
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: LEE, E. #1736 JEPS (HERB)

Dates Last Seen
Element: 1936-01-26
Site: 1936-01-26
Record Last Updated: 2004-08-06

Quad Summary: WOODSIDE (3712243/429A)
County Summary: SAN MATEO

Lat/Long: 37.42599° / -122.31211°
UTM: Zone-10 N4142352 E560862
Radius: 1/5 mile
Elevation: 2,000 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT
Township: 06S
Range: 04W
Section: 09 **Qtr:** XX
Meridian: M

Location: JUNCTION OF KINGS MOUNTAIN ROAD AND SKYLINE BLVD., KINGS MOUNTAIN, SANTA CRUZ MOUNTAINS.

Location Detail: EXACT LOCATION UNKNOWN. MAPPED AS BEST GUESS BY CNDDB, IN THE VICINITY OF THE JUNCTION OF KINGS MOUNTAIN ROAD AND SKYLINE BLVD., APPROX. 3.0 AIRMILES W OF WOODSIDE.

Ecological: ON ROCKY SLOPES ABOUT SUMMIT OF MOUNTAIN.

General: TYPE LOCALITY. NUMEROUS COLLECTIONS FROM THE SUMMIT OF KINGS MOUNTAIN ATTRIBUTED TO THIS SITE. UNKNOWN NUMBER OF PLANTS SEEN. NEEDS FIELDWORK.

Owner/Manager: UNKNOWN

Occurrence No. 6 **Map Index:** 56331 **EO Index:** 56347
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: TAYLOR, D. #15912 JEPS (HERB)

Dates Last Seen
Element: 1997-03-14
Site: 1997-03-14
Record Last Updated: 2004-08-06

Quad Summary: WOODSIDE (3712243/429A)
County Summary: SAN MATEO

Lat/Long: 37.43250° / -122.29567°
UTM: Zone-10 N4143086 E562311
Area: 132.3 ac
Elevation: 1,750 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POLYGON
Township: 06S
Range: 04W
Section: 09 **Qtr:** NE
Meridian: M

Location: KINGS MOUNTAIN ROAD, UNDER HIGH-VOLTAGE POWER LINES, KINGS MOUNTAIN, SANTA CRUZ MOUNTAINS.

Location Detail: EXACT LOCATION UNKNOWN. MAPPED AS BEST GUESS BY CNDDB, ALONG KINGS MOUNTAIN ROAD NEAR TRANSMISSION LINES, AT THE CORRESPONDING ELEVATION PROVIDED BY TAYLOR.

Ecological: CHAPARRAL WITH HETEROMELES ARBUTIFOLIA AND ADENOSTOMA FASCICULATUM, ARCTOSTAPHYLOS CRUSTACEA VAR. TOMENTOSIFORMIS AND (POSSIBLY) A. CRUSTACEA. ALSO ASSOCIATED WITH PSEUDOTSUGA MENZIESII.

General: SEVERAL COLLECTIONS FROM "ROAD TO KINGS MOUNTAIN FROM WOODSIDE" ATTRIBUTED TO THIS SITE. 1959 GANKIN COLLECTION ORIGINALLY LABELED A. ANDERSONII; NOT FURTHER ANNOTATED. UNKNOWN NUMBER OF PLANTS SEEN. NEEDS FIELDWORK.

Arctostaphylos regismontana

Kings Mountain manzanita

Element Code: PDERI041C0

Status		NDDB Element Ranks		Other Lists	
Federal:	None	**Global:**	G2	**CNPS List:**	1B
State:	None	**State:**	S2.2	**R-E-D Code:**	2-2-3

Habitat Associations

General: BROADLEAVED UPLAND FOREST, CHAPARRAL, NORTH COAST CONIFEROUS FOREST.

Micro: GRANITIC OR SANDSTONE OUTCROPS. 305-730M.

Owner/Manager: UNKNOWN

Occurrence No. 7 **Map Index:** 56332 **EO Index:** 56348

Occ Rank: Poor
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: CORELLI, T. 1994 (OBS)

Dates Last Seen
Element: 1994-11-29
Site: 1994-11-29

Record Last Updated: 2004-08-06

Quad Summary: WOODSIDE (3712243/429A)

County Summary: SAN MATEO

Lat/Long: 37.42713° / -122.28940°
UTM: Zone-10 N4142494 E562870
Area: 1.9 ac
Elevation: 1,100 ft
Mapping PrecisionSPECIFIC
Symbol Type:POLYGON
Township: 06S
Range: 04W
Section: 10 **Qtr:** NW
Meridian: M

Location: TEAGUE HILL OPEN SPACE PRESERVE AT THE END OF PINTO WAY, NW OF TRIPP GULCH (PARCEL A), WOODSIDE.

Location Detail: ONE POLYGON MAPPED APPROX. 0.1 MILE NW OF TRIPP GULCH, AND 0.3 MILE S OF KINGS MOUNTAIN ROAD.

Ecological: INTERIOR AND COAST LIVE OAK WOODLAND. WITH ARBUTUS MENZIESII, ARCTOSTAPHYLOS TOMENTOSA CRINITA, QUERCUS AGRIFOLIA AND Q. WISLIZENII.

General: TEN MATURE PLANTS SEEN IN 1994; NO MATURE PLANTS TAKING THEIR PLACE.

Owner/Manager: SMT COUNTY

Occurrence No. 8 **Map Index:** 56333 **EO Index:** 56349

Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: CORELLIS, T. 1994 (OBS)

Dates Last Seen
Element: 1994-11-29
Site: 1994-11-29

Record Last Updated: 2004-08-06

Quad Summary: WOODSIDE (3712243/429A)

County Summary: SAN MATEO

Lat/Long: 37.42413° / -122.28381°
UTM: Zone-10 N4142164 E563368
Area: 1.2 ac
Elevation: 1,100 ft
Mapping PrecisionSPECIFIC
Symbol Type:POLYGON
Township: 06S
Range: 04W
Section: 10 **Qtr:** SE
Meridian: M

Location: TEAGUE HILL OPEN SPACE PRESERVE AT THE END OF SUMMIT SPRINGS ROAD, NW OF APPLETREE GULCH (PARCEL B), WOODSIDE.

Location Detail: ONE POLYGON MAPPED APPROX. 0.2 MILE N OF APPLETREE GULCH, 0.5 MILE W OF TRIPP ROAD, AND 0.6 MILE S OF KINGS MOUNTAIN ROAD.

Ecological: BLACK OAK AND CANYON OAK WOODLAND. WITH ARBUTUS MENZIESII, QUERCUS CHRYSOLEPSIS, AND Q. KELLOGGII. SOIL IS SANDSTONE.

General: 40 MATURE PLANTS SEEN IN 1994; NO NEW PLANTS TAKING THIER PLACE.

Owner/Manager: SMT COUNTY

Arctostaphylos regismontana

Kings Mountain manzanita **Element Code:** PDERI041C0

Status		**NDDB Element Ranks**		**Other Lists**	
Federal:	None	**Global:**	G2	**CNPS List:**	1B
State:	None	**State:**	S2.2	**R-E-D Code:**	2-2-3

Habitat Associations
General: BROADLEAVED UPLAND FOREST, CHAPARRAL, NORTH COAST CONIFEROUS FOREST.
Micro: GRANITIC OR SANDSTONE OUTCROPS. 305-730M.

Occurrence No. 9 **Map Index:** 45121 **EO Index:** 56350
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: WALTHER, E. SN UNK HERB (HERB)

Dates Last Seen
Element: 1919-08-XX
Site: 1919-08-XX
Record Last Updated: 2004-08-06

Quad Summary: PALO ALTO (3712242/428B), WOODSIDE (3712243/429A)
County Summary: SAN MATEO

Lat/Long: 37.43043° / -122.25261°
UTM: Zone-10 N4142885 E566123
Radius: 1 mile
Elevation: 380 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT
Township: 06S
Range: 04W
Section: 12 **Qtr:** XX
Meridian: M

Location: WOODSIDE.

Location Detail: EXACT LOCATION UNKNOWN. MAPPED AS BEST GUESS BY CNDDB, IN THE VICINITY OF WOODSIDE, SOUTH OF REDWOOD CITY AND HWY

General: ONLY INFORMATION FOR THIS SITE IS REFERENCE TO WALTHER'S COLLECTION IN 1933 LEAFLETS OF WESTERN BOTANY. UNKNOWN NUMBER OF PLANTS SEEN IN 1919. NEEDS FIELDWORK.

Owner/Manager: UNKNOWN

Occurrence No. 10 **Map Index:** 56335 **EO Index:** 56351
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: SINDEL, G. #380 UC (HERB)

Dates Last Seen
Element: 1935-10-16
Site: 1935-10-16
Record Last Updated: 2004-08-06

Quad Summary: WOODSIDE (3712243/429A)
County Summary: SAN MATEO

Lat/Long: 37.41537° / -122.32581°
UTM: Zone-10 N4141166 E559658
Radius: 2/5 mile
Elevation: 2,100 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT
Township: 06S
Range: 04W
Section: 17 **Qtr:** XX
Meridian: M

Location: 1.15 MILES WNW OF SIERRA MORENO, SANTA CRUZ MOUNTAINS.

Location Detail: EXACT LOCATION UNKNOWN. MAPPED AS BEST GUESS BY CNDDB, 1.15 AIRMILES WNW OF SIERRA MORENA, E OF STAR HILL ROAD, AND APPROX. 0.3 MILE S OF KINGS MOUNTAIN SCHOOL.

Ecological: TIMBER, NW SLOPE.

General: UNKNOWN NUMBER OF PLANTS SEEN IN 1935. NEEDS FIELDWORK.

Owner/Manager: UNKNOWN

Occurrence No. 11 **Map Index:** 56336 **EO Index:** 56352
Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: CORELLI, T. 1994 (OBS)

Dates Last Seen
Element: 1994-03-17
Site: 1994-03-17
Record Last Updated: 2004-08-06

Quad Summary: WOODSIDE (3712243/429A)
County Summary: SAN MATEO

Lat/Long: 37.41203° / -122.30772°
UTM: Zone-10 N4140806 E561262
Area: 2.6 ac
Elevation: 2,100 ft
Mapping PrecisionSPECIFIC
Symbol Type:POLYGON
Township: 06S
Range: 04W
Section: 16 **Qtr:** NW
Meridian: M

Location: ALONG TRAIL AND ROAD TO VISTA POINT, EL CORTE DE MADERA OPEN SPACE PRESERVE, SIERRA MORENA, SANTA CRUZ MOUNTAINS.

Location Detail: ONE COLONY MAPPED AT SIERRA MORENA, JUST W OF SKYLINE BLVD., AND APPROX. 0.2 MILE NW OF SKEGGS POINT.

Ecological: DOUGLAS FIR FOREST AND OPENINGS IN THE FOREST. ALL PLANTS MATURE AND LOCATED IN DISTURBED AREAS. WITH ARBUTUS MENZIESII, LITHOCARPUS DENSIFLORUS, PSEUDOTSUGA MENZIESII, AND QUERCUS AGRIFOLIA. SUBSTRATE IS ORGANIC SANDSTONE.

Threat: TRAIL MAINTENANCE. MOUNTAIN BIKING.

General: TWO COLLECTIONS BY WIESLANDER FROM "SIERRA MORENO" ATTRIBUTED TO THIS SITE. LESS THAN 30 PLANTS SEEN IN 1994 IN THIS POLYGON AND TWO ADJACENT POLYGONS TO THE WEST (PART OF EO# 12).

Owner/Manager: SMT COUNTY

Arctostaphylos regismontana

Kings Mountain manzanita

Element Code: PDERI041C0

Status		NDDB Element Ranks		Other Lists	
Federal:	None	**Global:**	G2	**CNPS List:**	1B
State:	None	**State:**	S2.2	**R-E-D Code:**	2-2-3

Habitat Associations

General: BROADLEAVED UPLAND FOREST, CHAPARRAL, NORTH COAST CONIFEROUS FOREST.

Micro: GRANITIC OR SANDSTONE OUTCROPS. 305-730M.

Occurrence No. 12 **Map Index:** 56337 **EO Index:** 56353

Dates Last Seen
Element: 1994-02-08
Site: 1994-02-08

Occ Rank: Excellent
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: CORELLI, T. 1994 (OBS)

Record Last Updated: 2004-08-06

Quad Summary: WOODSIDE (3712243/429A)

County Summary: SAN MATEO

Lat/Long: 37.40334° / -122.32236°
UTM: Zone-10 N4139833 E559973
Area: 88.0 ac
Elevation: 2,200 ft
Mapping PrecisionSPECIFIC
Symbol Type:POLYGON
Township: 06S
Range: 04W
Section: 17 **Qtr:** S
Meridian: M

Location: AT THE END OF VISTA POINT TRAIL, EL CORTE DE MADERA OPEN SPACE PRESERVE, SANTA CRUZ MOUNTAINS.

Location Detail: FOUR COLONIES MAPPED AS THREE POLYGONS BY CNDDB, 0.5 - 1.0 MILE W OF SKYLINE BLVD., IN THE SE 1/4 OF SECTION 17, AND THE NE 1/4 OF SECTION 20.

Ecological: MANZANITA CHAPARRAL AND DOUGLAS FIR FOREST. WITH ADENOSTOMA FASCICULATUM, ARCTOSTAPHYLOS TOMENTOSA CRUSTACEA, A. T. CRINITA, BACCHARIS PILULARIS, ERIODICTYON CALIFORNICUM, CEANOTHUS THYRSIFLORUS, LEPECHINIA CALYCINA, & RHAMNUS CALIFORNICA.

General: LESS THAN 100 PLANTS SEEN IN 1994.

Owner/Manager: SMT COUNTY

Occurrence No. 13 **Map Index:** 56338 **EO Index:** 56354

Dates Last Seen
Element: 1994-03-17
Site: 1994-03-17

Occ Rank: Excellent
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: CORELLI, T. 1994 (OBS)

Record Last Updated: 2004-08-07

Quad Summary: WOODSIDE (3712243/429A)

County Summary: SAN MATEO

Lat/Long: 37.40089° / -122.29954°
UTM: Zone-10 N4139576 E561995
Area: 20.6 ac
Elevation: 2,100 ft
Mapping PrecisionSPECIFIC
Symbol Type:POLYGON
Township: 06S
Range: 04W
Section: 21 **Qtr:** NE
Meridian: M

Location: ALONG THE GORDON MILL TRAIL, EL CORTE DE MADERA OPEN SPACE PRESERVE, SANTA CRUZ MOUNTAINS.

Location Detail: FOUR COLONIES MAPPED AS FOUR POLYGONS IN THE NE 1/4 OF SECTION 21.

Ecological: IN DISTURBED AREAS WITHIN DOUGLAS FIR FOREST AND OPENINGS IN THE FOREST. MATURE PLANTS. WITH ARBUTUS MENZIESII, LITHOCARPUS DENSIFLORUS, PSEUDOTSUGA MENZIESII AND QUERCUS AGRIFOLIA. SUBSTRATE IS ORGANIC SANDSTONE.

General: LESS THAN 50 PLANTS SEEN IN 1994. THE PLANTS HERE SEEM TO BE THE MOST VIGOROUS AND BEST SPECIMENS OF THE ONES WITHIN THE DISTRICT.

Owner/Manager: SMT COUNTY

Arctostaphylos regismontana

Kings Mountain manzanita
Element Code: PDERI041C0

Status		**NDDB Element Ranks**		**Other Lists**	
Federal:	None	**Global:**	G2	**CNPS List:**	1B
State:	None	**State:**	S2.2	**R-E-D Code:**	2-2-3

Habitat Associations
General: BROADLEAVED UPLAND FOREST, CHAPARRAL, NORTH COAST CONIFEROUS FOREST.
Micro: GRANITIC OR SANDSTONE OUTCROPS. 305-730M.

Occurrence No. 14 **Map Index:** 56339 **EO Index:** 56355
Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: CORELLI, T. 1994 (OBS)

Dates Last Seen
Element: 1994-04-15
Site: 1994-04-15
Record Last Updated: 2004-08-07

Quad Summary: WOODSIDE (3712243/429A)
County Summary: SAN MATEO

Lat/Long: 37.38741° / -122.29826°
UTM: Zone-10 N4138081 E562119
Area: 2.9 ac
Elevation: 2,100 ft
Mapping PrecisionSPECIFIC
Symbol Type:POLYGON
Township: 06S
Range: 04W
Section: 28 **Qtr:** NE
Meridian: M

Location: BEGINNING OF THE LAWRENCE CREEK TRAIL, EL CORTE DE MADERA OPEN SPACE PRESERVE, SANTA CRUZ MOUNTAINS.

Location Detail: ONE POLYGON MAPPED IN THE NE 1/4 OF SECTION 28.

Ecological: OPEN DOUGLAS FIR FOREST. ALL PLANTS SEEM TO BE MATURE SPECIMENS LOCATED ALONG THE TRAIL. WITH LITHOCARPUS DENSIFLORUS, PSEUDOTSUGA MENZIESII AND QUERCUS AGRIFOLIA.

General: 1934 COLLECTION BY ROSE "SKYLINE BLVD. 4.0 MILES S OF KINGS MOUNTAIN" ATTRIBUTED TO THIS SITE. UNKNOWN NUMBER OF PLANTS SEEN IN 1934. 30 PLANTS SEEN IN 1994.

Owner/Manager: SMT COUNTY

Occurrence No. 15 **Map Index:** 56340 **EO Index:** 56356
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: KNIGHT & RAICHE #4414 CAS (HERB)

Dates Last Seen
Element: 1982-01-23
Site: 1982-01-23
Record Last Updated: 2004-08-07

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

Lat/Long: 37.55926° / -122.48225°
UTM: Zone-10 N4157042 E545727
Radius: 3/5 mile
Elevation: 1,800 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT
Township: 04S
Range: 06W
Section: 26 **Qtr:** NW
Meridian: M

Location: MONTARA MOUNTAIN.

Location Detail: EXACT LOCATION UNKOWN. MAPPED AS BEST GUESS BY CNDDB, IN THE VICINITY OF MONTARA KNOB, 1.5 MILES E OF HWY 1, 1.5 MILES NE OF MONTARA, AND 1.0 MILE SW OF WHITING RIDGE.

Ecological: WITH VACCINIUM OVATUM AND CHRYSOLEPSIS CHRYSOPHYLLA VAR. MINOR.

General: 1964 COLLECTION BY ROOF "MIDDLE SUMMIT OF MONTARA MOUNTAIN (PEAK MOUNTAIN)" ATTRIBUTED TO THIS SITE. UNKNOWN NUMBER OF PLANTS SEEN IN 1964 AND 1982. NEEDS FIELDWORK.

Owner/Manager: UNKNOWN

Astragalus pycnostachyus var. pycnostachyus

coastal marsh milk-vetch

Element Code: PDFAB0F7B2

Status
Federal: None
State: None

NDDB Element Ranks
Global: G2T2
State: S2.2

Other Lists
CNPS List: 1B
R-E-D Code: 3-2-3

Habitat Associations
General: COASTAL DUNES, COASTAL SALT MARSHES.
Micro: MESIC SITES IN DUNES OR ALONG STREAMS OR COASTAL SALT MARSHES. 0-30M.

Occurrence No. 8 **Map Index:** 49631 **EO Index:** 49631
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: C.F.B. #1744 UC #81253 (HERB)

Dates Last Seen
Element: 1902-10-01
Site: 2004-08-23
Record Last Updated: 2004-12-09

Quad Summary: HALF MOON BAY (3712244/429B), MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

Lat/Long: 37.50070° / -122.49709°
UTM: Zone-10 N4150538 E544451
Radius: 2/5 mile
Elevation: 10 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT
Township: 05S
Range: 06W
Section: 10 **Qtr:** XX
Meridian: M

Location: PILLAR POINT.

Threat: NON-NATIVE PLANTS, WATER QUALITY.

General: NEEDS FIELDWORK. ONLY SOURCE OF INFORMATION IS 1902 COLLECTION BY C.F.B. IN 2004, PLANTS NOT FOUND DURING LIMITED SURVEY OF PILLAR POINT MARSH. SUITABLE HABITAT EXISTS AT THIS LOCATION, FURTHER SURVEY NEEEDED.

Owner/Manager: UNKNOWN

Occurrence No. 9 **Map Index:** 45124 **EO Index:** 49632
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: BAYE, P. 1998 (PERS)

Dates Last Seen
Element: XXXX-XX-XX
Site: XXXX-XX-XX
Record Last Updated: 2002-12-13

Quad Summary: WOODSIDE (3712243/429A), SAN MATEO (3712253/448D)
County Summary: SAN MATEO

Lat/Long: 37.49700° / -122.33628°
UTM: Zone-10 N4150215 E558668
Radius: 1 mile
Elevation: 300 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT
Township: 05S
Range: 04W
Section: 18 **Qtr:** XX
Meridian: M

Location: CRYSTAL SPRINGS RESERVOIR.

Location Detail: LOCATION INFORMATION IS VERY VAGUE. MAPPED AS BEST GUESS AT UPPER CRYSTAL SPRINGS RESERVOIR BY CNDDB. UNSURE WHERE SEEN.

General: NEEDS FIELDWORK.

Owner/Manager: UNKNOWN

Calicina (=sitalcina) minor

Edgewood blind harvestman
Element Code: ILARA13020

Status
Federal: None
State: None

NDDB Element Ranks
Global: G1
State: S1

Other Lists
CDFG Status:

Habitat Associations
General: OPEN GRASSLAND IN AREAS OF SERPENTINE BEDROCK.
Micro: FOUND ON THE UNDERSIDE OF MOIST SERPENTINE ROCKS NEAR PERMANENT SPRINGS.

Occurrence No. 1 **Map Index:** 09136 **EO Index:** 12858
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: BRIGGS, T. 1984 (PERS)

Dates Last Seen
Element: 1983-01-02
Site: 1983-01-02
Record Last Updated: 2006-02-01

Quad Summary: WOODSIDE (3712243/429A)
County Summary: SAN MATEO

Lat/Long: 37.46632° / -122.28970°
UTM: Zone-10 N4146841 E562811
Radius: 1/5 mile
Elevation: 560 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT
Township: 05S
Range: 04W
Section: 27 **Qtr:** XX
Meridian: M

Location: EDGEWOOD PARK AREA; BOTH EAST AND WEST OF I-280.
Location Detail: NEW GENUS, ARTICLE 1989, COMPARITIVE MORPHOLOGY. FORMER EO #3-6 REFERRED TO MICROCINA HOMI.
Ecological: HABITAT CONSISTS OF MOIST, OPEN SERPENTINE GRASSLAND; USUALLY MID-SLOPE (0-20 DEGREES), WEST ASPECT.
General: EXCELLENT HABITAT FOR THIS SPECIES. OTHER RARE TAXA (BUTTERFLIES AND PLANTS) ALSO OCCUR IN THIS AREA.
Owner/Manager: SMT COUNTY

Occurrence No. 2 **Map Index:** 08942 **EO Index:** 22547
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: BRIGGS, T. & K. HOM 1966 (LIT)

Dates Last Seen
Element: 1966-01-23
Site: 1966-01-23
Record Last Updated: 2000-04-17

Quad Summary: SAN MATEO (3712253/448D)
County Summary: SAN MATEO

Lat/Long: 37.53715° / -122.37081°
UTM: Zone-10 N4154649 E555586
Radius: 1/5 mile
Elevation: 400 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT
Township: 04S
Range: 05W
Section: 35 **Qtr:** XX
Meridian: M

Location: SPRING 0.75 MI N OF CRYSTAL SPGS DAM ON COUNTY RD 14.
Location Detail: NEW GENUS, ARTICLE 1989, COMPARITIVE MORPHOLOGY.
General: HOLOTYPE LOCATION. TOPOTYPES COLLECTED 19 FEBRUARY 1966.
Owner/Manager: UNKNOWN

Callophrys mossii bayensis

San Bruno elfin butterfly

Element Code: IILEPE2202

Status		NDDB Element Ranks		Other Lists	
Federal:	Endangered	**Global:**	G4T1	**CDFG Status:**	
State:	None	**State:**	S1		

Habitat Associations

General: COASTAL, MOUNTAINOUS AREAS WITH GRASSY GROUND COVER, MAINLY IN THE VICINITY OF SAN BRUNO MOUNTAIN, SAN MATEO COUNTY.

Micro: COLONIES ARE LOCATED ON STEEP, NORTH-FACING SLOPES WITHIN THE FOG BELT. LARVAL HOST PLANT IS SEDUM SPATHULIFOLIUM.

Occurrence No. 1 **Map Index:** 08698 **EO Index:** 23059

Dates Last Seen
Element: 1977-03-XX
Site: 1977-03-XX
Record Last Updated: 1999-06-11

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: ARNOLD, R. 1978 (LIT)

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

Lat/Long: 37.56574° / -122.45471°
UTM: Zone-10 N4157774 E548155
Area: 223.5 ac
Elevation: 900 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POLYGON
Township: 04S
Range: 05W
Section: 19 **Qtr:** NW
Meridian: M

Location: ON WHITING RIDGE IN THE SAN FRANCISCO FISH AND GAME PRESERVE 1 MILE EAST OF NORTH PEAK.

Location Detail: COLONIES GENERALLY ON NORTH-FACING SLOPES IN THE "FOG BELT".

Ecological: COASTAL CHAPPARAL IS DOMINANT VEGETATION.

Owner/Manager: SFO CITY/COUNTY

Occurrence No. 14 **Map Index:** 08561 **EO Index:** 23049

Dates Last Seen
Element: 1984-05-30
Site: 1986-04-15
Record Last Updated: 2005-06-23

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: ARNOLD, R. 1984 (PERS)

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

Lat/Long: 37.56399° / -122.49528°
UTM: Zone-10 N4157560 E544574
Area: 960.0 ac
Elevation: 600 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POLYGON
Township: 04S
Range: 06W
Section: 22 **Qtr:** XX
Meridian: M

Location: MONTARA MOUNTAIN, FROM ABOUT 1 MILE SOUTH OF LINDA MAR SCHOOL IN SAN PEDRO VALLEY TO VICINCITY OF SOUTH PEAK.

Ecological: COASTAL CHAPARRAL IS DOMINANT VEGETATION.

Threat: THREATENED BY PROPOSED RE-ROUTING OF HWY 1.

General: 76 LARVAE COLLECTED FROM SEDUM SPATHULIFOLIUM; NO ADULTS OBSERVED 24 & 30 MAY 1984. SAN PEDRO MOUNTAIN, NEAR BM 924, CHECKED ON 15 APR 1986; COOL, RAINY WEATHER, SEDUM NOT FLOWERING - NEITHER LARVAE NOR BUTTERFLIES OBSERVED.

Owner/Manager: PVT

Centromadia parryi ssp. parryi

pappose tarplant

Element Code: PDAST4R0P2

Status		NDDB Element Ranks		Other Lists	
Federal:	None	**Global:**	G4?T2	**CNPS List:**	1B
State:	None	**State:**	S2.2	**R-E-D Code:**	2-2-3

Habitat Associations

General: COASTAL PRAIRIE, MEADOWS AND SEEPS, COASTAL SALT MARSH, VALLEY AND FOOTHILL GRASSLAND.

Micro: VERNALLY MESIC, OFTEN ALKALINE SITES. 2-420M.

Occurrence No. 1 **Map Index:** 08569 **EO Index:** 56478

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: NEWLON, L. #239 JEPS (HERB)

Dates Last Seen
Element: 1921-01-01
Site: 1921-01-01

Record Last Updated: 2004-08-25

Quad Summary: MONTARA MOUNTAIN (3712254/448C), SAN FRANCISCO SOUTH (3712264/448B)

County Summary: SAN MATEO

Lat/Long: 37.62659° / -122.49553°
UTM: Zone-10 N4164505 E544515
Radius: 1 mile
Elevation: 15 ft

Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT

Township: 03S
Range: 06W
Section: XX **Qtr:** XX
Meridian: M

Location: ALONG SEASHORE FROM SALADA TO MUSSEL BEACH.

Location Detail:EXACT LOCATION UNKNOWN. MAPPED AS BEST GUESS BY CNDDB, IN THE VICINITY OF LAGUNA SALADA, S OF MUSSEL BEACH, W OF PACIFICA.

Ecological: SEASHORE HABITAT.

General: UNKNOWN NUMBER OF PLANTS SEEN IN 1921. NEEDS FIELDWORK.

Owner/Manager: UNKNOWN

Charadrius alexandrinus nivosus

western snowy plover

Element Code: ABNNB03031

Status		NDDB Element Ranks		Other Lists	
Federal:	Threatened	**Global:**	G4T3	**CDFG Status:**	SC
State:	None	**State:**	S2		

Habitat Associations

General: (NESTING) FEDERAL LISTING APPLIES ONLY TO THE PACIFIC COASTAL POPULATION.

Micro: SANDY BEACHES, SALT POND LEVEES & SHORES OF LARGE ALKALI LAKES. NEEDS SANDY, GRAVELLY OR FRIABLE SOILS FOR NESTING.

Occurrence No. 86 **Map Index:** 09246 **EO Index:** 30099

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: PAGE, G. & L. STENZEL 1981 (LIT)

Dates Last Seen
Element: 1976-XX-XX
Site: 1978-XX-XX

Record Last Updated: 1999-11-04

Quad Summary: REDWOOD POINT (3712252/447C), SAN MATEO (3712253/448D)

County Summary: SAN MATEO

Lat/Long: 37.54215° / -122.25192°
UTM: Zone-10 N4155280 E566085
Radius: 1 mile
Elevation: 10 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT
Township: 04S
Range: 04W
Section: 36 **Qtr:** XX
Meridian: M

Location: NEAR BELMONT, SOUTH SAN FRANCISCO BAY.

Ecological: LIKELY HABITAT IS SALT EVAPORATORS.

General: TWO ADULTS OBSERVED IN 1972; NESTS OBSERVED IN 1975-76; 19 ADULTS OBSERVED DURING 1978 STUDY IN SAN MATEO COUNTY PORTION OF THE SOUTH BAY (UNKNOWN WHETHER THIS AREA WAS USED FOR NESTING).

Owner/Manager: UNKNOWN

Chorizanthe cuspidata var. cuspidata

San Francisco Bay spineflower

Element Code: PDPGN04081

Status		NDDB Element Ranks		Other Lists	
Federal:	None	**Global:**	G2T2	**CNPS List:**	1B
State:	None	**State:**	S2.2	**R-E-D Code:**	2-2-3

Habitat Associations

General: COASTAL BLUFF SCRUB, COASTAL DUNES, COASTAL PRAIRIE, COASTAL SCRUB.

Micro: CLOSELY RELATED TO C. PUNGENS. SANDY SOIL ON TERRACES AND SLOPES. 5-550M.

Occurrence No. 1 **Map Index:** 09025 **EO Index:** 58

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: EASTWOOD SN CAS #205022 (HERB)

Dates Last Seen
Element: 1933-06-01
Site: 1933-06-01
Record Last Updated: 1996-01-02

Quad Summary: WOODSIDE (3712243/429A), SAN MATEO (3712253/448D)

County Summary: SAN MATEO

Lat/Long: 37.50632° / -122.33219°
UTM: Zone-10 N4151252 E559023
Radius: 1 mile
Elevation: 500 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT
Township: 05S
Range: 04W
Section: 8 **Qtr:** XX
Meridian: M

Location: NEAR RELIEF HOUSE.

Location Detail:MAPPED NEAR THE JUNCTION OF I-280 AND HIGHWAY 92 NEAR SAN MATEO.

Ecological: SANDY GROUND.

General: EASTWOOD COLLECTION IS THE MAIN SOURCE OF INFORMATION FOR THIS SITE. 1903 COLLECTION BY ELMER (#4793, CAS) FROM "CRYSTAL SPRINGS LAKE" IS ALSO ATTRIBUTED TO THIS SITE.

Owner/Manager: UNKNOWN

Occurrence No. 2 **Map Index:** 08569 **EO Index:** 29054

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: COOPER, W. #12 JEPS #57718 (HERB)

Dates Last Seen
Element: 1925-05-28
Site: 1925-05-28
Record Last Updated: 1996-01-02

Quad Summary: MONTARA MOUNTAIN (3712254/448C), SAN FRANCISCO SOUTH (3712264/448B)

County Summary: SAN MATEO

Lat/Long: 37.62659° / -122.49553°
UTM: Zone-10 N4164505 E544515
Radius: 1 mile
Elevation: 15 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT
Township: 03S
Range: 06W
Section: XX **Qtr:** XX
Meridian: M

Location: SALADA.

Location Detail:MAPPED AT LAGUNA SALADA, WEST OF PACIFICA. COLLECTIONS FROM SAN PEDRO (SANCHEZ), APPARENTLY A HISTORIC MEXICAN LAND GRANT, ARE ALSO MAPPED AT THIS SITE.

General: MAIN SOURCE OF INFORMATION IS 1925 COLLECTION BY COOPER. 1903 COLLECTION BY ELMER (#4793, UC) FROM "SAN PEDRO (SANCHEZ)" IS ALSO ATTRIBUTED TO THIS SITE.

Owner/Manager: UNKNOWN

Cirsium andrewsii

Franciscan thistle

Element Code: PDAST2E050

Status

Federal: None
State: None

NDDB Element Ranks

Global: G2
State: S2.2

Other Lists

CNPS List: 1B
R-E-D Code: 2-2-3

Habitat Associations

General: COASTAL BLUFF SCRUB, BROADLEAVED UPLAND FOREST, COASTAL SCRUB.
Micro: SOMETIMES SERPENTINE SEEPS. 0-135M.

Occurrence No. 2 **Map Index:** 46040 **EO Index:** 56705

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: GREENE 1891 (LIT)

Dates Last Seen
Element: XXXX-XX-XX
Site: XXXX-XX-XX

Record Last Updated: 2004-09-15

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

Lat/Long: 37.59393° / -122.51908°
UTM: Zone-10 N4160871 E542455
Radius: 1 mile
Elevation:
Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT
Township: 04S
Range: 06W
Section: 10 **Qtr:** XX
Meridian: M

Location: E SIDE OF POINT SAN PEDRO IN SAN MATEO COUNTY.

Location Detail: EXACT LOCATION UNKNOWN. MAPPED AS BEST GUESS BY CNDDB, E OF POINT SAN PEDRO, W OF HWY 1, APPROX. 1.0 MILE S OF PACIFICA.

Ecological: ON STREAM BANKS.

General: ONLY INFORMATION FOR THIS SITE IS GREENE'S 1891 "MANUAL OF THE BOTANY OF THE REGION OF SAN FRANCISCO BAY", REFERENCED BY STRATHMANN IN HER 2001 NATURAL HISTORY SUMMARY AND RESEARCH RECOMMENDATIONS FOR C. ANDREWSII. NEEDS FIELDWORK.

Owner/Manager: UNKNOWN

Occurrence No. 3 **Map Index:** 56703 **EO Index:** 56719

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: STRATHMANN, K. & M. VASEY 2000 (PERS)

Dates Last Seen
Element: 2000-06-XX
Site: 2000-06-XX

Record Last Updated: 2004-09-15

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

Lat/Long: 37.56784° / -122.50946°
UTM: Zone-10 N4157981 E543319
Radius: 2/5 mile
Elevation: 200 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT
Township: 04S
Range: 06W
Section: 22 **Qtr:** XX
Meridian: M

Location: GREEN VALLEY COASTAL DRAINAGE OF MONTARA MOUNTAIN, S OF POINT SAN PEDRO.

Location Detail: EXACT LOCATION UNKNOWN. MAPPED AS BEST GUESS BY CNDDB, IN THE VICINITY OF GREEN VALLEY, APPROX. 2.0 MILES S OF POINT SAN PEDRO.

Ecological: IN A DRAINAGE.

General: ONLY INFORMATION FOR THIS SITE IS REFERENCE IN STRATHMANN'S NATURAL HISTORY SUMMARY AND RESEARCH RECOMMENDATIONS FRO C. ANDREWSII. UNKNOWN NUMBER OF PLANTS SEEN IN 2000. NEEDS FIELDWORK.

Owner/Manager: UNKNOWN

Cirsium fontinale var. fontinale

fountain thistle

Element Code: PDAST2E161

Status
Federal: Endangered
State: Endangered

NDDB Element Ranks
Global: G2T1
State: S1.1

Other Lists
CNPS List: 1B
R-E-D Code: 3-3-3

Habitat Associations
General: VALLEY AND FOOTHILL GRASSLAND, CHAPARRAL.
Micro: SERPENTINE SEEPS AND GRASSLAND. 90-180M.

Occurrence No. 1 **Map Index:** 08988 **EO Index:** 28589
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: CHANDIK, Z. 1989 (OBS)

Dates Last Seen
Element: 1992-XX-XX
Site: 1992-XX-XX
Record Last Updated: 1998-04-10

Quad Summary: SAN MATEO (3712253/448D)
County Summary: SAN MATEO

Lat/Long: 37.51339° / -122.34958°
UTM: Zone-10 N4152025 E557480
Area: 15.8 ac
Elevation: 400 ft
Mapping PrecisionSPECIFIC
Symbol Type:POLYGON
Township: 05S
Range: 04W
Section: 7 **Qtr:** XX
Meridian: M

Location: EAST SIDE OF CRYSTAL SPRINGS RESERVOIR, JUST NORTH OF RALSTON AVENUE NEAR JUNCTION WITH SKYLINE BLVD ON SW PULGAS RIDGE.

Location Detail: E AND W OF HWY 280. SOME PLANTS ARE ON SAN FRANCISCO WATERSHED LAND, FENCED OFF TO THE PUBLIC. ALL BUT ONE OF THE EO 1 SUBPOPS ARE LOCATED N OF SKYLINE BLVD. PLANTS MAPPED IN CENTER POLYGON REPORTED BY D. KELCH TO BE EXTIRPATED.

Ecological: IN SERPENTINE GRASSLAND AND SEEPAGE AREA WITH PERPETUAL MOISTURE ON OPEN HILLSIDES. WITH CAREX SP., MIMULUS GUTTATUS, PLANTAGO LANCEOLATA, P. HIRTELLA, AND PERIDERIDIA GANDERI. HESPEROLINON CONGESTUM AND NATIVE BUNCHGRASSES NEARBY.

Threat: INTENSE URBANIZATION. HWY 280 MAY HAVE DESTROYED OR CUT OFF WATER SUPPLY TO PART OF SITE. 7/88 FIRE BURNED MANY PLANTS.

General: TYPE LOCALITY. 5 SUBPOPULATIONS; 200+ PLANTS SEEN 1N 1966, ABOUT 500 SEEN IN 1981 IN LESS THAN 1 HA. MAY HYBRIDIZE W/C. QUERCATORIUM. FIRE DIDN'T SEEM TO IMPACT PLANTS ADVERSELY, NONNATIVES SEEMED TO BENEFIT. 650+ PLANTS SEEN IN 1989.

Owner/Manager: SAN FRANCISCO PUC

Occurrence No. 2 **Map Index:** 08998 **EO Index:** 28588
Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: HIMES, K. & S. TIMBY 1989 (OBS)

Dates Last Seen
Element: 1996-08-08
Site: 1996-08-08
Record Last Updated: 1998-04-10

Quad Summary: SAN MATEO (3712253/448D)
County Summary: SAN MATEO

Lat/Long: 37.50829° / -122.33715°
UTM: Zone-10 N4151467 E558583
Area: 13.6 ac
Elevation: 450 ft
Mapping PrecisionSPECIFIC
Symbol Type:POLYGON
Township: 05S
Range: 04W
Section: 7 **Qtr:** XX
Meridian: M

Location: SOUTH END OF PULGAS RIDGE, EAST SIDE CRYSTAL SPRINGS RESERVOIR, WEST OF HILLCREST DETENTION HOME, NORTH OF RALSTON AVE.

Location Detail: N OF THE HWY 92-280 INTERCHANGE; CLUSTERED AROUND THE INTERCHANGE. THIS OCC MAY HAVE BEEN CONTINUOUS W/OCC #1 BEFORE CONSTRUCTION OF HWY 280.

Ecological: IN ROCKY HEAVY SATURATED SERPENTINE CLAY HILLSIDE INTERRUPTED BY HIGHWAY 280 INTERCHANGE. ASSOCIATED WITH STACHYS AJUGOIDES, MIMULUS GUTTATUS, BACCHARIS, SALIX, TYPHA, AND PAMPAS GRASS.

Threat: CALTRANS LANDSCAPING AND PAMPAS GRASS CONTROL COULD THREATEN. INTRODUCED WEEVIL MAY ALSO THREATEN.

General: AT LEAST 1200 PLANTS SEEN IN 1989 IN 3 SUBPOPULATIONS, 2500 IN `94, 1600 IN `95, 2300 IN `96.

Owner/Manager: CALTRANS, SFPUC

Cirsium fontinale var. fontinale

fountain thistle

Element Code: PDAST2E161

Status
Federal: Endangered
State: Endangered

NDDB Element Ranks
Global: G2T1
State: S1.1

Other Lists
CNPS List: 1B
R-E-D Code: 3-3-3

Habitat Associations
General: VALLEY AND FOOTHILL GRASSLAND, CHAPARRAL.
Micro: SERPENTINE SEEPS AND GRASSLAND. 90-180M.

Occurrence No. 4 **Map Index:** 21233 **EO Index:** 20767
Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Decreasing
Main Source: CORELLI, T. 1984 (MAP)

Dates Last Seen
Element: 1997-04-XX
Site: 1997-04-XX
Record Last Updated: 1998-04-10

Quad Summary: WOODSIDE (3712243/429A)
County Summary: SAN MATEO

Lat/Long: 37.46467° / -122.29160°
UTM: Zone-10 N4146657 E562645
Radius: 80 meters
Elevation: 570 ft
Mapping PrecisionSPECIFIC
Symbol Type:POINT
Township: 05S
Range: 04W
Section: 27 **Qtr:** XX
Meridian: M

Location: JUST WEST OF EDGEWOOD PARK, ON WEST SIDE OF HWY 280, ABOUT 2.2 HWY MILES NW OF REDWOOD CITY EXIT.

Ecological: ON SERPENTINE SOIL IN GRASSLAND ASSOCIATED WITH NASSELLA PULCHRA, S. LEPIDA, LOTUS PURSHIANUS, AND LINANTHUS.

Threat: THREATS ARE FENCE MAINTENANCE ACTIVITY AND POSSIBLE DEVELOPMENT. SOME NON-NATIVE PLANTS UPSLOPE FROM SITE.

General: ABOUT 200 PLANTS SEEN IN 1985, LESS THAN 100 PLANTS IN A 20 SQ FT AREA SEEN IN 1989. DETAILED INFO FROM RECENT SITE VISITS NEEDED.

Owner/Manager: CALTRANS, PVT

Occurrence No. 5 **Map Index:** 21011 **EO Index:** 9191
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: VONARB, R. 1988 (OBS)

Dates Last Seen
Element: 1988-07-XX
Site: 1988-07-XX
Record Last Updated: 1998-04-10

Quad Summary: SAN MATEO (3712253/448D)
County Summary: SAN MATEO

Lat/Long: 37.50612° / -122.34194°
UTM: Zone-10 N4151223 E558161
Radius: 80 meters
Elevation: 300 ft
Mapping PrecisionSPECIFIC
Symbol Type:POINT
Township: 05S
Range: 04W
Section: 7 **Qtr:** XX
Meridian: M

Location: SE END OF UPPER CRYSTAL SPRINGS RESERVOIR, SW SIDE SKYLINE BLVD/HWY 280 INTERCHANGE. WEST SIDE OF CANADA ROAD.

Location Detail: MANAGED BY SAN FRANCISCO WATER DEPARTMENT.

Ecological: SERPENTINE SEEP IN OBISPO CLAY AND FAGAN LOAM SOILS. WNW-FACING SLOPE WITH CORTADERIA SELLOANA, CAREX SPP., MIMULUS GUTATTUS, POLYPOGON SP., ZYGADENUS FREMONTII, AND AVENA FATUA.

Threat: DEVELOPMENT COULD THREATEN.

General: 750 PLANTS SEEN IN AN AREA 5000 SQ FT.

Owner/Manager: SFO CITY/COUNTY(MGMT BY SFPUC)

Cirsium fontinale var. fontinale

fountain thistle

Element Code: PDAST2E161

Status
Federal: Endangered
State: Endangered

NDDB Element Ranks
Global: G2T1
State: S1.1

Other Lists
CNPS List: 1B
R-E-D Code: 3-3-3

Habitat Associations
General: VALLEY AND FOOTHILL GRASSLAND, CHAPARRAL.
Micro: SERPENTINE SEEPS AND GRASSLAND. 90-180M.

Occurrence No. 6 **Map Index:** 30521 **EO Index:** 4492
Occ Rank: None
Origin: Natural/Native occurrence
Presence: Possibly Extirpated
Trend: Unknown
Main Source: THOMAS REID ASSOC. 1993 (LIT)

Dates Last Seen
Element: 1993-XX-XX
Site: 1996-07-11

Record Last Updated: 1998-04-10

Quad Summary: WOODSIDE (3712243/429A)
County Summary: SAN MATEO

Lat/Long: 37.45908° / -122.28366°
UTM: Zone-10 N4146042 E563352
Radius: 80 meters
Elevation: 600 ft
Mapping PrecisionSPECIFIC
Symbol Type:POINT
Township: 05S
Range: 04W
Section: 34 **Qtr:** XX
Meridian: M

Location: SOUTHERN END OF EDGEWOOD COUNTY PARK, CLARKIA TRAIL. 0.8 MI SSE OF INTERSECTION EDGEWOOD ROAD AND I-280.

Ecological: IN SERPENTINE SEEP NEAR SEVERAL OTHER RARE PLANTS INCLUDING HESPEROLINON CONGESTUM AND FRITILLARIA LILIACEA.

Threat: TRAIL MAINTENANCE AND RECREATION ACTIVITIES THRE6

General: ONLY 1 PLANT SEEN IN 1993. ENTIRE LENGTH OF TRAIL SURVEYED IN 1996; SOME SUITABLE HABITAT FOUND, BUT NO PLANTS WERE FOUND.

Owner/Manager: SMT COUNTY

Collinsia multicolor

San Francisco collinsia

Element Code: PDSCR0H0B0

Status
Federal: None
State: None

NDDB Element Ranks
Global: G2
State: S2.2

Other Lists
CNPS List: 1B
R-E-D Code: 2-2-3

Habitat Associations
General: CLOSED-CONE CONIFEROUS FOREST, COASTAL SCRUB.
Micro: ON DECOMPOSED SHALE (MUDSTONE) MIXED WITH HUMUS. 30-250M.

Occurrence No. 10 **Map Index:** 56854 **EO Index:** 56870
Occ Rank: Excellent
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: CORELLI, T. 1996 (PERS)

Dates Last Seen
Element: XXXX-XX-XX
Site: XXXX-XX-XX
Record Last Updated: 2004-09-20

Quad Summary: WOODSIDE (3712243/429A)
County Summary: SAN MATEO

Lat/Long: 37.46709° / -122.28081°
UTM: Zone-10 N4146933 E563596
Area: 2.1 ac
Elevation: 600 ft
Mapping PrecisionSPECIFIC
Symbol Type:POLYGON
Township: 05S
Range: 04W
Section: 27 **Qtr:** SE
Meridian: M

Location: EDGEWOOD PARK, SAN MATEO COUNTY.

Location Detail: 1 POLYGON MAPPED IN THE EAST-CENTRAL AREA OF THE PARK, 0.5 MILE S OF EDGEWOOD ROAD, AND 0.6 MILE E OF HWY 280. IN NE1/4 OF SE1/4 SEC 27.

Ecological: MIXED FOOTHILL WOODLAND AND BROADLEAF FOREST ON STEEP SLOPE. WITH FERNS, MOSSES, LIVERWORTS, TOXICODENDRON DIVERSILOBUM, ROSA SP., SYMPHORICARPOS, AESCULUS, UMBELLULARIA, FESTUCA, SAXIFRAGA CALIFORNICA, GALIUM SP., AND CYNOGLOSSUM.

Threat: TRAIL USE; TRAIL MAINTENANCE.

General: 300 PLANTS SEEN IN 1985. UNKNOWN NUMBER OF PLANTS SEEN DURING SUBSEQUENT SITE VISITS. OTHER RARE PLANT NEARBY: DIRCA OCCIDENTALIS.

Owner/Manager: SMT COUNTY

Occurrence No. 11 **Map Index:** 49014 **EO Index:** 56871
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: TAYLOR, D. #14276 UC (HERB)

Dates Last Seen
Element: 1994-05-10
Site: 1994-05-10
Record Last Updated: 2004-09-22

Quad Summary: SAN MATEO (3712253/448D)
County Summary: SAN MATEO

Lat/Long: 37.54433° / -122.34713°
UTM: Zone-10 N4155459 E557673
Area: 57.6 ac
Elevation: 220 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POLYGON
Township: 04S
Range: 04W
Section: 31 **Qtr:** NW
Meridian: M

Location: SAN MATEO CREEK DRAINAGE, ALONG CRYSTAL SPRINGS ROAD 0.3 MILE E OF JUNCTION WITH TARTAN TRAIL.

Location Detail: EXACT LOCATION UNKNOWN. MAPPED AS BEST GUESS BY CNDDB, ALONG CRYSTAL SPRINGS ROAD, APPROX. 1.0 MILE N NNE OF ITS JUNCTION WITH POLHEMUS ROAD. USED COORDINATES IN TAYLOR #14276.

Ecological: STEEP, SHADED UNDERSTORY OF N-FACING WOODLAND OF QUERCUS AGRIFOLIA AND UMBELLULARIA CALIFORNICA ON S SIDE OF CREEK. ROCKY BUT HUMUS-RICH SOIL.

General: 1987 COLLECTION BY BUCK "1.5 KM NNE OF CONFLUENCE OF SAN MATEO AND POLHEMUS CREEKS" ATTRIBUTED TO THIS SITE. UNKNOWN NUMBER OF PLANTS SEEN IN 1987 AND 1994.

Owner/Manager: UNKNOWN

Collinsia multicolor

San Francisco collinsia

Element Code: PDSCR0H0B0

Status

Federal: None
State: None

NDDB Element Ranks

Global: G2
State: S2.2

Other Lists

CNPS List: 1B
R-E-D Code: 2-2-3

Habitat Associations

General: CLOSED-CONE CONIFEROUS FOREST, COASTAL SCRUB.
Micro: ON DECOMPOSED SHALE (MUDSTONE) MIXED WITH HUMUS. 30-250M.

Occurrence No. 12 **Map Index:** 56856 **EO Index:** 56872
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: HOOVER, R. #4901 UC (HERB)

Dates Last Seen
Element: 1941-04-23
Site: 1941-04-23
Record Last Updated: 2004-09-21

Quad Summary: SAN MATEO (3712253/448D)
County Summary: SAN MATEO

Lat/Long: 37.53017° / -122.36058°
UTM: Zone-10 N4153881 E556495
Radius: 1/5 mile
Elevation: 300 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT
Township: 05S
Range: 05W
Section: 01 **Qtr:** N
Meridian: M

Location: SAN MATEO CREEK BELOW CRYSTAL SPRINGS DAM.

Location Detail:EXACT LOCATION UNKNOWN. MAPPED AS BEST GUESS BY CNDDB, IN THE VICINITY OF SAN MATEO CREEK AT CRYSTAL SPRINGS DAM.

General: UNKNOWN NUMBER OF PLANTS SEEN IN 1941. NEEDS FIELDWORK.

Owner/Manager: UNKNOWN

Occurrence No. 13 **Map Index:** 46040 **EO Index:** 56873
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: HOLLORAN, P. 1998 (PERS)

Dates Last Seen
Element: XXXX-XX-XX
Site: XXXX-XX-XX
Record Last Updated: 2004-09-21

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

Lat/Long: 37.59393° / -122.51908°
UTM: Zone-10 N4160871 E542455
Radius: 1 mile
Elevation:
Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT
Township: 04S
Range: 06W
Section: 10 **Qtr:** XX
Meridian: M

Location: PEDRO POINT HEADLAND.

Location Detail:EXACT LOCATION UNKNOWN. MAPPED AS BEST GUESS BY CNDDB, IN THE VICINITY OF POINT SAN PEDRO.

General: PER HOLLORAN, 1998, A "SMALL" POPULATION EXISTS AT THIS SITE. UNKNOWN DATE OF SITE VISIT; UNKNOWN NUMBER OF PLANTS SEEN. NEEDS FIELDWORK.

Owner/Manager: UNKNOWN

Occurrence No. 14 **Map Index:** 45075 **EO Index:** 56874
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: DAVY, B. #1025 UC (HERB)

Dates Last Seen
Element: 1895-04-20
Site: 1895-04-20
Record Last Updated: 2004-09-21

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

Lat/Long: 37.59064° / -122.41007°
UTM: Zone-10 N4160561 E552080
Radius: 1 mile
Elevation:
Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT
Township: 04S
Range: 05W
Section: 16 **Qtr:** XX
Meridian: M

Location: MILLBRAE.

Location Detail:EXACT LOCATION UNKNOWN. MAPPED AS BEST GUESS BY CNDDB, IN THE VICINITY OF MILLBRAE AND SAN ANDREAS LAKE.

General: UNKNOWN NUMBER OF PLANTS SEEN IN 1895. NEEDS FIELDWORK.

Owner/Manager: UNKNOWN

Collinsia multicolor

San Francisco collinsia

Element Code: PDSCR0H0B0

Status		NDDB Element Ranks		Other Lists	
Federal:	None	**Global:**	G2	**CNPS List:**	1B
State:	None	**State:**	S2.2	**R-E-D Code:**	2-2-3

Habitat Associations

General: CLOSED-CONE CONIFEROUS FOREST, COASTAL SCRUB.

Micro: ON DECOMPOSED SHALE (MUDSTONE) MIXED WITH HUMUS. 30-250M.

Occurrence No. 15 **Map Index:** 26631 **EO Index:** 56875

Occ Rank: Unknown

Origin: Natural/Native occurrence

Presence: Presumed Extant

Trend: Unknown

Main Source: DAVY, B. #1134 UC (HERB)

Dates Last Seen

Element: 1893-06-23

Site: 1893-06-23

Record Last Updated: 2004-09-21

Quad Summary: MONTARA MOUNTAIN (3712254/448C)

County Summary: SAN MATEO

Lat/Long: 37.55173° / -122.42686°

UTM: Zone-10 N4156235 E550625

Radius: 1 mile

Elevation: 800 ft

Mapping PrecisionNON-SPECIFIC

Symbol Type:POINT

Township: 04S

Range: 05W

Section: 29 **Qtr:** XX

Meridian: M

Location: PILARCITOS LAKE AND CANYON.

Location Detail:EXACT LOCATION UNKNOWN. MAPPED AS BEST GUESS BY CNDDB, IN THE VICINITY OF PILARCITOS LAKE AND CANYON.

General: UNKNOWN NUMBER OF PLANTS SEEN IN 1893. NEEDS FIELDWORK.

Owner/Manager: UNKNOWN

Cordylanthus maritimus ssp. palustris

Point Reyes bird's-beak

Element Code: PDSCR0J0C3

Status		NDDB Element Ranks		Other Lists	
Federal:	None	**Global:**	G4?T2	**CNPS List:**	1B
State:	None	**State:**	S2.2	**R-E-D Code:**	2-2-2

Habitat Associations

General: COASTAL SALT MARSH.

Micro: USUALLY IN COASTAL SALT MARSH WITH SALICORNIA, DISTICHLIS, JAUMEA, SPARTINA, ETC. 0-15M.

Occurrence No. 62 **Map Index:** 09246 **EO Index:** 42161

Occ Rank: None
Origin: Natural/Native occurrence
Presence: Possibly Extirpated
Trend: Unknown
Main Source: DAVY, J. #773 UC (HERB)

Dates Last Seen
Element: 1893-06-17
Site: 1893-06-17

Record Last Updated: 2000-01-14

Quad Summary: REDWOOD POINT (3712252/447C), SAN MATEO (3712253/448D)

County Summary: SAN MATEO

Lat/Long: 37.54215° / -122.25192°
UTM: Zone-10 N4155280 E566085
Radius: 1 mile
Elevation: 10 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT
Township: 04S
Range: 04W
Section: 36 **Qtr:** XX
Meridian: M

Location: BELMONT, SALT MARSH, SAN MATEO COUNTY.

General: ONLY SOURCE OF INFORMATION FOR THIS SITE IS 1893 COLLECTION BY DAVY. POSSIBLY EXTINCT ACCORDING TO HECKARD; EXTIRPATED ACCORDING TO D. SMITH (1996).

Owner/Manager: UNKNOWN

Danaus plexippus

monarch butterfly

Element Code: IILEPP2010

Status
Federal: None
State: None

NDDB Element Ranks
Global: G5
State: S3

Other Lists
CDFG Status:

Habitat Associations
General: WINTER ROOST SITES EXTEND ALONG THE COAST FROM NORTHERN MENDOCINO TO BAJA CALIFORNIA, MEXICO.
Micro: ROOSTS LOCATED IN WIND-PROTECTED TREE GROVES (EUCALYPTUS, MONTEREY PINE, CYPRESS), WITH NECTAR AND WATER SOURCES NEARBY.

Occurrence No. 56 **Map Index:** 09064 **EO Index:** 22931
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: SAKAI, W. 1989 (OBS)

Dates Last Seen
Element: 1987-12-12
Site: 1987-12-12
Record Last Updated: 1996-01-08

Quad Summary: SAN MATEO (3712253/448D)
County Summary: SAN MATEO

Lat/Long: 37.58993° / -122.32163°
UTM: Zone-10 N4160535 E559889
Radius: 1/5 mile
Elevation: 50 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT
Township: 04S
Range: 04W
Section: 17 **Qtr:** XX
Meridian: M

Location: COYOTE POINT COUNTY PARK, SAN MATEO.
Location Detail: BEST SITES APPEAR TO BE IN THE VICINITY OF THE MUSEUM.
General: NO CLUSTERS FOUND; A FEW FLYING AROUND IN THE FALL AND ONE COLD, BUT HEALTHY, INDIVIDUAL FOUND ON THE GROUND ON 12 DECEMBER 1987.
Owner/Manager: SMT COUNTY

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* SENSITIVE *

Occurrence No. 64 **Map Index:** 08512 **EO Index:** 22925
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: SAKAI, W. 1989 (OBS)

Dates Last Seen
Element: 1987-11-27
Site: 1991-XX-XX
Record Last Updated: 1996-01-08

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

* SENSITIVE *
Lat/Long:
UTM:
Radius:
Elevation:
Mapping Precision:
Symbol Type:
Township:
Range:
Section: **Qtr:**
Meridian:

Location: *SENSITIVE* Location information suppressed.
Location Detail: Please contact the Calfornia Natural Diversity Database, California Department of Fish and Game, for more information: (916) 324-3812.
Ecological: HABITAT IS EUCALYPTUS AND RICH STREAMSIDE VEGETATION IN A PROTECTED GULLEY.
Threat: RE-ROUTING OF HWY 1 AROUND DEVIL'S SLIDE AREA IS A POSSIBLE THREAT.
Owner/Manager:

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* SENSITIVE *

Occurrence No. 65 **Map Index:** 08606 **EO Index:** 13262
Occ Rank: None
Origin: Natural/Native occurrence
Presence: Extirpated
Trend: Decreasing
Main Source: SAKAI, W. 1989 (OBS)

Dates Last Seen
Element: 198-XXXX
Site: 1998-01-05
Record Last Updated: 1998-10-21

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

* SENSITIVE *
Lat/Long:
UTM:
Radius:
Elevation:
Mapping Precision:
Symbol Type:
Township:
Range:
Section: **Qtr:**
Meridian:

Location: *SENSITIVE* Location information suppressed.
Location Detail: Please contact the Calfornia Natural Diversity Database, California Department of Fish and Game, for more information: (916) 324-3812.
Ecological: HABITAT IS A GROVE OF EUCALYPTUS RUNNING SOUTHWEST TO NORTHEAST; SURROUNDING AREA IS MADE UP OF LIGHT RESIDENTIAL AND HIGHLY DISTURBED PATCHES OF NATIVE VEGETATION.
Threat: DEVELOPMENT IS THE MAIN THREAT; HOUSES NOW SIT WHERE THE ROOST SITE ONCE WAS.
Owner/Manager:

Danaus plexippus

monarch butterfly

Element Code: IILEPP2010

Status		NDDB Element Ranks		Other Lists	
Federal:	None	**Global:**	G5	**CDFG Status:**	
State:	None	**State:**	S3		

Habitat Associations

General: WINTER ROOST SITES EXTEND ALONG THE COAST FROM NORTHERN MENDOCINO TO BAJA CALIFORNIA, MEXICO.

Micro: ROOSTS LOCATED IN WIND-PROTECTED TREE GROVES (EUCALYPTUS, MONTEREY PINE, CYPRESS), WITH NECTAR AND WATER SOURCES NEARBY.

Occurrence No. 66 **Map Index:** 08654 **EO Index:** 22924

Dates Last Seen
Element: XXXX-XX-XX
Site: XXXX-XX-XX

*** SENSITIVE ***

Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: SAKAI, W. 1989 (OBS)

Record Last Updated: 1996-01-08

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

*** SENSITIVE ***

Lat/Long:
UTM:
Radius:
Elevation:
Mapping Precision:
Symbol Type:
Township:
Range:
Section: **Qtr:**
Meridian:

Location: *SENSITIVE* Location information suppressed.

Location Detail: Please contact the Calfornia Natural Diversity Database, California Department of Fish and Game, for more information: (916) 324-3812.

Ecological: HABITAT IS AN EXTENSIVE EUCALYPTUS GROVE BEING INVADED BY LIGHT RESIDENTIAL.

Threat: MAIN THREAT IS TREE REMOVAL FOR DEVELOPMENT PURPOSES.

Owner/Manager:

Dipodomys venustus venustus

Santa Cruz kangaroo rat

Element Code: AMAFD03042

Status
Federal: None
State: None

NDDB Element Ranks
Global: G4T1
State: S1

Other Lists
CDFG Status:

Habitat Associations
General: SILVERLEAF MANZANITA MIXED CHAPARRAL IN THE ZAYANTE SAND HILLS ECOSYSTEM OF THE SANTA CRUZ MOUNTAINS.
Micro: NEEDS SOFT-WELL DRAINED SAND.

Occurrence No. 11 **Map Index:** 52690 **EO Index:** 59322
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: MANIS 2004 (MUS)

Dates Last Seen
Element: 1933-08-08
Site: 1933-08-08
Record Last Updated: 2005-02-23

Quad Summary: PALO ALTO (3712242/428B), WOODSIDE (3712243/429A), REDWOOD POINT (3712252/447C), SAN MATEO (3712253/448D)
County Summary: SANTA CLARA, SAN MATEO

Lat/Long: 37.48134° / -122.24148°
UTM: Zone-10 N4148541 E567062
Radius: 5 mile
Elevation: 5 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT
Township: 05S
Range: 04W
Section: 24 **Qtr:** XX
Meridian: M

Location: REDWOOD CITY, SOUTH SAN FRANCISCO BAY.

Location Detail:EXACT LOCATION UNKNOWN. MAPPED IN THE GENERAL VICINTY OF REDWOOD CITY.

General: 1 UNKNOWN SPECIMEN COLLECTED 8 AUG 1933 BY A. HOLM AT "REDWOOD CITY." DEPOSITED AT CAS #7521. GRINNELL ALSO COLLECTED A SPECIMEN AT "BELMONT" IN 1904.

Owner/Manager: UNKNOWN

Dirca occidentalis

western leatherwood

Element Code: PDTHY03010

Status
Federal: None
State: None

NDDB Element Ranks
Global: G2G3
State: S2S3

Other Lists
CNPS List: 1B
R-E-D Code: 2-2-3

Habitat Associations
General: BROADLEAFED UPLAND FOREST, CHAPARRAL, CLOSED-CONE CONIF FOR, CISMONTANE WDLND, N COAST CONIF FOR, RIP FOR, RIP WDLND.
Micro: ON BRUSHY SLOPES, MESIC SITES; MOSTLY IN MIXED EVERGREEN & FOOTHILL WOODLAND COMMUNITIES. 30-550M.

Occurrence No. 7 **Map Index:** 28652 **EO Index:** 29965
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: CORELLI, T. 1985 (OBS)

Dates Last Seen
Element: 1993-07-XX
Site: 1993-07-XX
Record Last Updated: 1996-12-20

Quad Summary: WOODSIDE (3712243/429A)
County Summary: SAN MATEO

Lat/Long: 37.47373° / -122.28115°
UTM: Zone-10 N4147669 E563561
Area: 4.5 ac
Elevation: 350 ft
Mapping PrecisionSPECIFIC
Symbol Type:POLYGON
Township: 05S
Range: 04W
Section: 27 **Qtr:** XX
Meridian: M

Location: EDGEWOOD COUNTY PARK, NORTH END OF PARK NEAR JUNCTION OF EDGEWOOD ROAD AND CRESTVIEW ROAD.

Location Detail:DOWNSLOPE OF SERVICE ROAD JUST PAST THE RANGERS QUARTERS.

Ecological: FOOTHILL WOODLAND WITH AESCULUS, QUERCUS, UMBELLULARIA, HETEROMELES, LONICERA, ROSA, DIPLACUS, RIBES, DRYOPTERIS, PITYROGRAMMA, FESTUCA, RHAMNUS, SANICULA, SATUREJA, THALICTRUM, AND TOXICODENDRON.

General: FEWER THAN 100 PLANTS NOTED IN 1985.

Owner/Manager: SMT COUNTY

Occurrence No. 8 **Map Index:** 28653 **EO Index:** 29966
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: CORELLI, T. 1985 (OBS)

Dates Last Seen
Element: 1993-07-XX
Site: 1993-07-XX
Record Last Updated: 2006-02-02

Quad Summary: WOODSIDE (3712243/429A)
County Summary: SAN MATEO

Lat/Long: 37.46822° / -122.27725°
UTM: Zone-10 N4147060 E563911
Area: 7.4 ac
Elevation: 350 ft
Mapping PrecisionSPECIFIC
Symbol Type:POLYGON
Township: 05S
Range: 04W
Section: 26 **Qtr:** SW
Meridian: M

Location: EDGEWOOD COUNTY PARK, EAST SIDE OF PARK ALONG SYLVAN TRAIL.

Ecological: FOOTHILL WOODLAND WITH AESCULUS, QUERCUS, UMBELLULARIA, HETEROMELES, LONICERA, ROSA, DIPLACUS, RIBES, DRYOPTERIS, PITYROGRAMMA, FESTUCA, RHAMNUS, SANICULA, SATUREJA, THALICTRUM, AND TOXICODENDRON. N SLOPE.

Threat: TRAIL CONSTRUCTION.

General: ABOUT 500 PLANTS OBSERVED IN 1985.

Owner/Manager: SMT COUNTY

Occurrence No. 9 **Map Index:** 28654 **EO Index:** 29967
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: THOMAS REID ASSOC. 1993 (LIT)

Dates Last Seen
Element: 1993-07-XX
Site: 1993-07-XX
Record Last Updated: 1996-12-20

Quad Summary: WOODSIDE (3712243/429A)
County Summary: SAN MATEO

Lat/Long: 37.45840° / -122.28200°
UTM: Zone-10 N4145968 E563499
Area: 6.2 ac
Elevation: 700 ft
Mapping PrecisionSPECIFIC
Symbol Type:POLYGON
Township: 05S
Range: 04W
Section: 34 **Qtr:** XX
Meridian: M

Location: EDGEWOOD COUNTY PARK, SOUTH END OF PARK JUST EAST OF THE PG&E SUBSTATION.

Ecological: WOODLAND HABITAT.

General: ONLY SOURCE OF INFORMATION FOR THIS SITE IS 1993 "EDGEWOOD COUNTY PARK GOLF COURSE CONSTRAINTS ANALYSIS" BY THOMAS REID ASSOCIATES.

Owner/Manager: SMT COUNTY

Dirca occidentalis

western leatherwood

Element Code: PDTHY03010

Status		NDDB Element Ranks		Other Lists	
Federal:	None	**Global:**	G2G3	**CNPS List:**	1B
State:	None	**State:**	S2S3	**R-E-D Code:**	2-2-3

Habitat Associations

General: BROADLEAFED UPLAND FOREST, CHAPARRAL, CLOSED-CONE CONIF FOR, CISMONTANE WDLND, N COAST CONIF FOR, RIP FOR, RIP WDLND.

Micro: ON BRUSHY SLOPES, MESIC SITES; MOSTLY IN MIXED EVERGREEN & FOOTHILL WOODLAND COMMUNITIES. 30-550M.

Occurrence No. 10 **Map Index:** 28656 **EO Index:** 29977

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: HOWELL, J. #30012 CAS #388067 (HERB)

Dates Last Seen
Element: 1954-07-08
Site: 1954-07-08
Record Last Updated: 1997-01-03

Quad Summary: MONTARA MOUNTAIN (3712254/448C)

County Summary: SAN MATEO

Lat/Long: 37.54031° / -122.41584°
UTM: Zone-10 N4154973 E551606
Radius: 2/5 mile
Elevation: 800 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT
Township: 04S
Range: 05W
Section: 33 **Qtr:** XX
Meridian: M

Location: 0.5 MILE BELOW LAKE PILARCTOS DAM.

Location Detail: COLLECTIONS FROM "NEAR TOP OF MONTARA MOUNTAIN" AND "ABOUT 1 MILE NORTH OF STONE DAM..." ARE ALSO ATTRIBUTED TO THIS SITE. SITE APPROXIMATED IN BETWEEN STONE DAM RES. AND PILARCITOS LAKE. CNDDB MAPPED SITE IS BEST GUESS.

Ecological: HABITATS INCLUDE DOUGLAS FIR FOREST AND WOODED CANYON.

General: THREE COLLECTIONS ATTRIBUTED TO THIS SITE; HOWELL (#30012 CAS) IN 1954, SINNOTT (#611 CAS) IN 1975, AND DUDLEY (SN DS) IN 1900.

Owner/Manager: UNKNOWN

Occurrence No. 11 **Map Index:** 28655 **EO Index:** 29976

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: BREEDLOVE #5916 CAS #727405 (HERB)

Dates Last Seen
Element: 1972-02-07
Site: 1972-02-07
Record Last Updated: 2006-02-03

Quad Summary: MONTARA MOUNTAIN (3712254/448C)

County Summary: SAN MATEO

Lat/Long: 37.56839° / -122.40038°
UTM: Zone-10 N4158097 E552952
Radius: 1 mile
Elevation: 400 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT
Township: 04S
Range: 05W
Section: 22 **Qtr:** XX
Meridian: M

Location: IN SAN ANDREAS CANYON BELOW THE DAM.

Location Detail: COLLECTIONS FROM "SAN ANDREAS LAKE," "NEAR SAN ANDREAS LAKE," AND "1 MI SE OF SAN ANDREAS LAKE" ARE ALSO ATTRIBUTED TO THIS SITE.

Ecological: EDGE OF MIXED EVERGREEN FOREST AND OAK WOODLAND. ASSOCIATED WITH UMBELLULARIA, AESCULUS, QUERCUS AGRIFOILIA, ARBUTUS, AND TOXICODENDRON.

General: MORE SPECIFIC LOCATION INFORMATION NEEDED.

Owner/Manager: UNKNOWN

Dirca occidentalis

western leatherwood

Element Code: PDTHY03010

Status		NDDB Element Ranks		Other Lists	
Federal:	None	**Global:**	G2G3	**CNPS List:**	1B
State:	None	**State:**	S2S3	**R-E-D Code:**	2-2-3

Habitat Associations

General: BROADLEAFED UPLAND FOREST, CHAPARRAL, CLOSED-CONE CONIF FOR, CISMONTANE WDLND, N COAST CONIF FOR, RIP FOR, RIP WDLND.

Micro: ON BRUSHY SLOPES, MESIC SITES; MOSTLY IN MIXED EVERGREEN & FOOTHILL WOODLAND COMMUNITIES. 30-550M.

Occurrence No.	35	**Map Index:** 45124	**EO Index:** 51482	**Dates Last Seen**	
Occ Rank:	Unknown			**Element:**	1980-05-16
Origin:	Natural/Native occurrence			**Site:**	1980-05-16
Presence:	Presumed Extant				
Trend:	Unknown			**Record Last Updated:**	2006-02-02
Main Source:	ROSE, L. #39060 UC #872739 (HERB)				

Quad Summary: WOODSIDE (3712243/429A), SAN MATEO (3712253/448D)

County Summary: SAN MATEO

Lat/Long:	37.49700° / -122.33628°		**Township:**	05S		
UTM:	Zone-10 N4150215 E558668		**Range:**	04W		
Radius:	1 mile	**Mapping Precision**NON-SPECIFIC	**Section:**	18	**Qtr:**	XX
Elevation:	300 ft	**Symbol Type:**POINT	**Meridian:**	M		

Location: CRYSTAL SPRINGS LAKE.

Location Detail: EXACT LOCATION UNKNOWN, MAPPED IN THE SOUTHERN PORTION OF CRYSTAL SPRINGS RESERVOIR.

Ecological: SHADY MOIST WOODS.

General: 3 COLLECTIONS FROM THIS AREA ATTRIBUTED TO THIS SITE: ROSE (#39060 UC) FROM 1939, ROSE (#64004) IN 1964, & SPJUT & STOFFEY (#6197 HSC) IN 1980. MOST REFER TO "UPPER CRYSTAL SPRINGS LAKE"; MAPPED HERE BY CNDDB. FIELDWORK NEEDED.

Owner/Manager: UNKNOWN

Occurrence No.	37	**Map Index:** 51525	**EO Index:** 51525	**Dates Last Seen**	
Occ Rank:	Fair			**Element:**	2001-03-23
Origin:	Natural/Native occurrence			**Site:**	2001-03-23
Presence:	Presumed Extant				
Trend:	Unknown			**Record Last Updated:**	2003-06-12
Main Source:	JOHNSON, B. 2001 (OBS)				

Quad Summary: MONTARA MOUNTAIN (3712254/448C)

County Summary: SAN MATEO

Lat/Long:	37.61623° / -122.44936°		**Township:**	04S		
UTM:	Zone-10 N4163378 E548595		**Range:**	05W		
Area:	0.9 ac	**Mapping Precision**SPECIFIC	**Section:**	06	**Qtr:**	NE
Elevation:	580 ft	**Symbol Type:**POLYGON	**Meridian:**	M		

Location: NORTH OF SAN ANDREAS LAKE, ALONG NORTHERNMOST INLET STREAM, ENE OF SWEENEY RIDGE.

Location Detail: TWO SMALL POPULATIONS LOCATED PRIMARILY IN THE WESTERN HALF OF THE NORTHEAST 1/4 OF SECTION 6.

Ecological: MODERATELY SLOPING SW-FACING HILLSIDE DOMINATED BY COASTAL SCRUB SPECIES: BACCHARIS PILULARIS, TOXICODENDRON DIVERSILOBUM & PRUNUS ILLICIFOLIA WITH SANICULA CRASSICAULIS & MARAH IN UNDERSTORY.

Threat: PART OF NORTHERN COLONY IS MOWED, SOUTHERN COLONY IS ADJACENT TO ROAD.

General: UNKNOWN NUMBER OF INDIVIDUALS OBSERVED IN 2000. 15 IN NORTHERN COLONY & 5 IN SOUTHERN COLONY IN 2001. SITE VISITED IN 2002, BUT PLANT #'S NOT REPORTED.

Owner/Manager: SAN FRANCISCO PUC

Dirca occidentalis

western leatherwood

Element Code: PDTHY03010

Status

Federal: None
State: None

NDDB Element Ranks

Global: G2G3
State: S2S3

Other Lists

CNPS List: 1B
R-E-D Code: 2-2-3

Habitat Associations

General: BROADLEAFED UPLAND FOREST, CHAPARRAL, CLOSED-CONE CONIF FOR, CISMONTANE WDLND, N COAST CONIF FOR, RIP FOR, RIP WDLND.

Micro: ON BRUSHY SLOPES, MESIC SITES; MOSTLY IN MIXED EVERGREEN & FOOTHILL WOODLAND COMMUNITIES. 30-550M.

Occurrence No. 38 **Map Index:** 51527 **EO Index:** 51527

Occ Rank: Excellent
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: JOHNSON, B. 2001 (OBS)

Dates Last Seen

Element: 2001-03-30
Site: 2001-03-30

Record Last Updated: 2003-06-12

Quad Summary: MONTARA MOUNTAIN (3712254/448C)

County Summary: SAN MATEO

Lat/Long: 37.55842° / -122.42699°
UTM: Zone-10 N4156976 E550609
Area: 0.8 ac
Elevation: 760 ft

Mapping PrecisionSPECIFIC
Symbol Type:POLYGON

Township: 04S
Range: 05W
Section: 29 **Qtr:** NE
Meridian: M

Location: JUST NORTH OF PILARCITOS LAKE, STREAM BETWEEN FITFIELD RIDGE & SPRING VALLEY RIDGE.

Location Detail: ONE SMALL COLONY LOCATED IN THE SOUTHEAST 1/4 OF THE NORTHEAST 1/4 OF SECTION 29.

Ecological: NORTHEAST FACING SLOPE DOMINATED BY SHRUBS WITH SCATTERED DOUGLAS FIR TREES AT BOTTOM OF SLOPE, ASSOC: RHAMNUS, CERCOCARPUS.

Threat: BISECTED BY ROAD.

General: 10+ INDIVIDUALS, POPULATION LIKELY MUCH LARGER THAN MAPPED.

Owner/Manager: SAN FRANCISCO PUC

Occurrence No. 41 **Map Index:** 63950 **EO Index:** 64045

Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: KAN, T. 2002 (PERS)

Dates Last Seen

Element: 2002-03-XX
Site: 2002-03-XX

Record Last Updated: 2006-02-10

Quad Summary: LA HONDA (3712233/429D), WOODSIDE (3712243/429A)

County Summary: SAN MATEO

Lat/Long: 37.37141° / -122.26556°
UTM: Zone-10 N4136329 E565028
Area: 70.4 ac
Elevation: 1,000 ft

Mapping PrecisionNON-SPECIFIC
Symbol Type:POLYGON

Township: 06S
Range: 04W
Section: 35 **Qtr:** SE
Meridian: M

Location: LA HONDA CREEK PRESERVE. ALONG UNNAMED TRAIL ALONG LA HONDA CREEK.

Location Detail: EXACT LOCATION(S) NOT KNOWN. MAPPED BY CNDDB AS BEST GUESS ALONG THE MAIN CHANNEL OF LA HONDA CREEK WHERE IT CROSSES THE LA HONDA CREEK PRESERVE.

Ecological: ALONG TRAILSIDE IN COAST REDWOOD RIPARIAN FOREST. ASSOCIATES INCLUDE: UMBELLULARIA CALIFORNICA, SEQUOIA SEMPERVIRENS, QUERCUS CHRYSOLEPIS, TOXICODENDRON DIVERSILOBUM, AESCULUS CALIFORNICA, RUBUS URSINUS, BACCHARIS PILULARIS, ETC.

General: 47 PLANTS OBSERVED IN 2002.

Owner/Manager: MIDPENIN REG OPEN SPACE DIST

Eriophyllum latilobum

San Mateo woolly sunflower
Element Code: PDAST3N060

Status		NDDB Element Ranks		Other Lists	
Federal:	Endangered	**Global:**	G1	**CNPS List:**	1B
State:	Endangered	**State:**	S1.1	**R-E-D Code:**	3-3-3

Habitat Associations
General: CISMONTANE WOODLAND.
Micro: OFTEN ON ROADCUTS; FOUND ON AND OFF OF SERPENTINE. 45-150M.

Occurrence No. 1 **Map Index:** 08972 **EO Index:** 9083
Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Decreasing
Main Source: MOORING, J. 1986 (OBS)

Dates Last Seen
Element: 2002-05-09
Site: 2002-05-09
Record Last Updated: 2005-10-31

Quad Summary: SAN MATEO (3712253/448D)
County Summary: SAN MATEO

Lat/Long: 37.53970° / -122.34973°
UTM: Zone-10 N4154944 E557447
Area: 35.1 ac
Elevation: 150 ft
Mapping PrecisionSPECIFIC
Symbol Type:POLYGON
Township: 04S
Range: 04W
Section: 31 **Qtr:** XX
Meridian: M

Location: CRYSTAL SPRINGS ROAD, BETWEEN I-280 AND MERNER ROAD, HILLSBOROUGH.

Ecological: USUALLY IN SHADY SPOTS ALONG ROAD CUT AND ON SLOPES WITH QUERCUS AGRIFOLIA, AESCULUS, UMBELLULARIA, STIPA LEPIDA, CALOCHORTUS ALBA, LOTUS SCOPARIUS, AND ARTEMISIA CALIFORNICA. PLANTS GROWING W/ E. CONFERTIFOLIA JUST S OF TARTAN TRAIL RD.

Threat: THREATENED BY ROAD MAINTENANCE, EROSION, DEVELOPMENT, MOWING, ROADSIDE HERBICIDE APPLICATION, QUARRIES, AND WEEDS.

General: 221 PLANTS OBSERVED IN 1991. ~315 IN 1992. ~60 IN 1993. 163 IN 1994. A FEW PLANTS IN BLOOM IN 1997. 189 IN 2001. 53 SEEN IN 2002 IN PARTIAL SURVEY ALONG SAN MATEO CREEK, BUT 31 OF THESE WERE KILLED BY HERBICIDE.

Owner/Manager: PVT, SMT COUNTY

Occurrence No. 4 **Map Index:** 63000 **EO Index:** 63073
Occ Rank: Excellent
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: CORELLI, T. 2004 (OBS)

Dates Last Seen
Element: 2004-06-02
Site: 2004-06-02
Record Last Updated: 2005-10-31

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

Lat/Long: 37.54579° / -122.40290°
UTM: Zone-10 N4155589 E552745
Radius: 80 meters
Elevation: 500 ft
Mapping PrecisionSPECIFIC
Symbol Type:POINT
Township: 04S
Range: 05W
Section: 34 **Qtr:** NW
Meridian: M

Location: BETWEEN SAWYER RIDGE AND SAN MATEO CREEK, SW OF HILLSBOROUGH.

Location Detail: ON CUT AND FILL SLOPES ALONG SAN MATEO ROAD 2.

Ecological: OPENING IN MIXED EVERGREEN FOREST. DOMINANTS: QUERCUS AGRIFOLIA AND PSEUDOTSUGA MENZIESII. ASSOCIATES: AESCULUS CALIFORNICUS, LOTUS SCOPARIUS, AND MIMULUS AURANTIACUS. SUBSTRATE IS POSSIBLY LIMESTONE OR CHERT.

Threat: ROAD MAINTENANCE, EROSION.

General: 207 PLANTS OBSERVED IN 2004.

Owner/Manager: SAN FRANCISCO PUC

Euphydryas editha bayensis

Bay checkerspot butterfly

Element Code: IILEPK4055

Status

Federal: Threatened
State: None

NDDB Element Ranks

Global: G5T1
State: S1

Other Lists

CDFG Status:

Habitat Associations

General: RESTRICTED TO NATIVE GRASSLANDS ON OUTCROPS OF SERPENTINE SOIL IN THE VICINITY OF SAN FRANCISCO BAY.

Micro: PLANTAGO ERECTA IS THE PRIMARY HOST PLANT; ORTHOCARPUS DENSIFLORUS & O. PURPURSCENS ARE THE SECONDARY HOST PLANTS.

Occurrence No. 3 **Map Index:** 08976 **EO Index:** 22992

Occ Rank: None
Origin: Natural/Native occurrence
Presence: Extirpated
Trend: Unknown
Main Source: WILCOX, B. ET AL 1980 (PERS)

Dates Last Seen
Element: 1977-XX-XX
Site: 1994-XX-XX

Record Last Updated: 1999-09-20

Quad Summary: SAN MATEO (3712253/448D)
County Summary: SAN MATEO

Lat/Long: 37.52050° / -122.34606°
UTM: Zone-10 N4152816 E557786
Area: 793.8 ac
Elevation: 300 ft

Mapping PrecisionNON-SPECIFIC
Symbol Type:POLYGON

Township: 05S
Range: 04W
Section: 06 **Qtr:** XX
Meridian: M

Location: PULGAS RIDGE, NEAR HILLSBOROUGH

Ecological: FORMER SERPENTINE GRASSLAND HABITAT; EXTIRPATED IN 1977 DUE TO THE COMBINED EFFECTS OF THE SEVERE DROUGHT OF 1977, HABITAT MODIFICATION RESULTING FROM CONSTRUCTION OF I-280, AND HOUSING.

General: TYPE LOCALITY.

Owner/Manager: SAN FRANCISCO PUC

Occurrence No. 4 **Map Index:** 09228 **EO Index:** 22991

Occ Rank: None
Origin: Natural/Native occurrence
Presence: Possibly Extirpated
Trend: Unknown
Main Source: MURPHY AND EHRLICH, 1980 (LIT)

Dates Last Seen
Element: 1983-XX-XX
Site: 1994-XX-XX

Record Last Updated: 1999-09-16

Quad Summary: WOODSIDE (3712243/429A)
County Summary: SAN MATEO

Lat/Long: 37.44909° / -122.25746°
UTM: Zone-10 N4144952 E565678
Radius: 1/5 mile
Elevation: 500 ft

Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT

Township: 05S
Range: 04W
Section: 36 **Qtr:** XX
Meridian: M

Location: WOODSIDE SITE, NORTHEAST OF CANADA COLLEGE, WITHIN THE CITY LIMITS OF REDWOOD CITY

Location Detail: SITE WAS LARGELY ELIMINATED BY A HOUSING DEVELOPMENT, LEAVING A SMALL, 26-ACRE REMNANT. SECURE, PROTECTIVE OWNERSHIP RENDERS THIS SITE POTENTIALLY GOOD FOR RE-ESTABLISHMENT.

Ecological: HABITAT CONSISTS OF SERPENTINE GRASSLAND CONTAINING THE TWO LARVAL FOODPLANTS: PLANTAGO ERECTA AND ORTHOCARPUS DENSIFLORUS. OTHER RARE TAXA FOUND AT THIS SITE INCLUDE FRITILLARIA LILIACEA AND HESPEROLINON CONGESTUM.

Threat: THREATENED BY WATER/FERTILIZER/PESTICIDE RUN-OFF FROM UPHILL RESIDENCES.

General: SITE CHECKED DURING SPRING 1994; NO ADULTS OBSERVED.

Owner/Manager: PVT

Euphydryas editha bayensis

Bay checkerspot butterfly

Element Code: IILEPK4055

Status		NDDB Element Ranks		Other Lists	
Federal:	Threatened	**Global:**	G5T1	**CDFG Status:**	
State:	None	**State:**	S1		

Habitat Associations

General: RESTRICTED TO NATIVE GRASSLANDS ON OUTCROPS OF SERPENTINE SOIL IN THE VICINITY OF SAN FRANCISCO BAY.

Micro: PLANTAGO ERECTA IS THE PRIMARY HOST PLANT; ORTHOCARPUS DENSIFLORUS & O. PURPURSCENS ARE THE SECONDARY HOST PLANTS.

Occurrence No. 6 **Map Index:** 33768 **EO Index:** 59

Dates Last Seen
Element: 198X-XX-XX
Site: 1993-XX-XX

Occ Rank: None
Origin: Natural/Native occurrence
Presence: Possibly Extirpated
Trend: Decreasing
Main Source: WILCOX, B. ET AL 1980 (PERS)
Record Last Updated: 1999-08-12

Quad Summary: SAN MATEO (3712253/448D)

County Summary: SAN MATEO

Lat/Long: 37.51008° / -122.33994°
UTM: Zone-10 N4151664 E558335
Area: 11.7 ac
Elevation: 500 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POLYGON
Township: 05S
Range: 04W
Section: 07 **Qtr:** XX
Meridian: M

Location: "SAN MATEO" SITE, NEAR INTERSECTION OF I-280 AND HIGHWAY 92, EAST OF CRYSTAL SPRINGS RESERVOIR.

Location Detail: HABITAT AT ONE TIME EXTENDED FROM NE OF CRYSTAL SPRINGS RESERVOIR TO THE SE, BEYOND THE HWY 92/I-280 INTERSECTION, PRIOR TO I-280 CONSTRUCTION.

Ecological: HABITAT CONSISTS OF SERPENTINE-BASED GRASSLAND.

General: COLONY WAS BELIEVED EXTIRPATED AFTER I-280 CONSTRUCTION; HOWEVER, A REMNANT COLONY OR RECOLONIZATION WAS DISCOVERED NORTH OF THE INTERSECTION. HOWEVER, NO BUTTERFLIES HAVE BEEN FOUND 1989-1993.

Owner/Manager: UNKNOWN

Occurrence No. 16 **Map Index:** 33755 **EO Index:** 1263

Dates Last Seen
Element: 1999-05-XX
Site: 1999-05-XX

Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Fluctuating
Main Source: U.S. FISH & WILDLIFE SERVICE 1987 (MAP)
Record Last Updated: 1999-09-15

Quad Summary: WOODSIDE (3712243/429A)

County Summary: SAN MATEO

Lat/Long: 37.46327° / -122.28662°
UTM: Zone-10 N4146505 E563086
Area: 223.8 ac
Elevation: 640 ft
Mapping PrecisionSPECIFIC
Symbol Type:POLYGON
Township: 05S
Range: 04W
Section: 27 **Qtr:** XX
Meridian: M

Location: EDGEWOOD COUNTY PARK, SOUTH OF THE INTERSECTION OF EDGEWOOD ROAD AND I-280, WEST OF REDWOOD CITY.

Location Detail: SITE CONSISTS OF 6 SUB-AREAS, LABELLED A THROUGH F, LOCATED EAST AND WEST OF I-280. THIS IS THE SECOND-LARGEST REMAINING AREA OF HABITAT; VITAL TO THE CONTINUED SURVIVAL OF THE SPECIES.

Ecological: HABITAT CONSISTS OF SERPENTINE OUTCROPS SUPPORTING ABUNDANT GROWTH OF THE BUTTERFLY'S TWO LARVAL FOODPLANTS: ANNUAL PLANTAGO ERECTA AND HEMIPARASITIC ANNUAL ORTHOCARPUS DENSIFLORUS. RARE PLANTS ARE ALSO FOUND AT THIS SITE.

General: ADULTS NUMBERED FROM THE LOW 100K'S IN THE EARLY 1900'S TO THE LOW 1000'S BY 1993. 1000'S OF ADULTS OBSERVED, 1994 AND 1997. ADULTS PRESENT, 1995. 1000'S OBSERVED IN AREA B, 10'S IN AREA D IN 1998. 100'S OBSERVED ONLY IN AREA B IN 1999.

Owner/Manager: SMT COUNTY

Fritillaria biflora var. ineziana

Hillsborough chocolate lily

Element Code: PMLIL0V031

Status		NDDB Element Ranks		Other Lists	
Federal:	None	**Global:**	G1QT1Q	**CNPS List:**	1B
State:	None	**State:**	S1.1	**R-E-D Code:**	3-3-3

Habitat Associations

General: CISMONTANE WOODLAND, VALLEY AND FOOTHILL GRASSLAND.

Micro: PROBABLY ON SERPENTINE; MOST RECENT SITE IS IN SERPENTINE GRASSLAND. 90-160M.

Occurrence No. 1 **Map Index:** 26559 **EO Index:** 1678

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: JEPSON, W. 1909 (LIT)

Dates Last Seen
Element: XXXX-XX-XX
Site: XXXX-XX-XX

Record Last Updated: 1995-10-02

Quad Summary: SAN MATEO (3712253/448D), MONTARA MOUNTAIN (3712254/448C)

County Summary: SAN MATEO

Lat/Long: 37.56478° / -122.36552°
UTM: Zone-10 N4157717 E556033
Radius: 1 mile
Elevation: 300 ft

Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT

Township: 04S
Range: 05W
Section: 24 **Qtr:** XX
Meridian: M

Location: HILLSBORC (SIC), SAN MATEO COUNTY.

Location Detail:MAPPED NEAR THE MIDDLE OF THE CITY OF HILLSBOROUGH.

General: TYPE LOCALITY. ONLY SOURCE OF INFORMATION IS SITE NAME FROM COLLECTION BY I. SMITH.

Owner/Manager: UNKNOWN

Occurrence No. 2 **Map Index:** 26561 **EO Index:** 1675

Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: HIMES, K. 1988 (OBS)

Dates Last Seen
Element: 1988-03-12
Site: 1988-03-12

Record Last Updated: 1996-01-10

Quad Summary: SAN MATEO (3712253/448D)

County Summary: SAN MATEO

Lat/Long: 37.53812° / -122.36846°
UTM: Zone-10 N4154757 E555793
Area: 2.8 ac
Elevation: 525 ft

Mapping PrecisionSPECIFIC
Symbol Type:POLYGON

Township: 04S
Range: 05W
Section: 36 **Qtr:** XX
Meridian: M

Location: BURI BURI RIDGE SOUTHWEST OF HILLSBOROUGH, WEST-SIDE OF SKYLINE BLVD AND 0.5 MILE NORTH OF CRYSTAL SPRINGS ROAD.

Location Detail:THERE IS A REST STOP IN THIS AREA THAT IS ON HWY 280 AND DIRECTLY EAST FROM THE FRITILLARIA COLONIES. TWO COLONIES MAPPED AS ONE EO AT CNDDB.

Ecological: SERPENTINE BUNCHGRASS. HESPEROLINON CONGESTUM ALSO OCCURS AT THIS SITE. FRITILLARIAS ARE FOUND IN DEEPER SOIL; HESPEROLINON ARE ON THINNER SOILS.

Threat: PLANTED MONTEREY AND COULTER PINES HAVE IMPACTED A CONSIDERABLE AREA.

General: 1225 PLANTS OBSERVED IN 1988. REMOVAL OF THE PLANTED TREES HAS BEEN RECOMMENDED. POPULATION IS WITHIN THE BOUNDARIES OF THE FISH AND GAME REFUGE AT CRYSTAL SPRINGS RESERVOIR.

Owner/Manager: SFO CITY/COUNTY(MGMT BY SFPUC)

Fritillaria liliacea

fragrant fritillary

Element Code: PMLIL0V0C0

Status
Federal: None
State: None

NDDB Element Ranks
Global: G2
State: S2.2

Other Lists
CNPS List: 1B
R-E-D Code: 2-2-3

Habitat Associations
General: COASTAL SCRUB, VALLEY AND FOOTHILL GRASSLAND, COASTAL PRAIRIE.
Micro: OFTEN ON SERPENTINE; VARIOUS SOILS REPORTED THOUGH USUALLY CLAY, IN GRASSLAND. 3-410M.

Occurrence No. 19 **Map Index:** 21010 **EO Index:** 13989
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: VONARB, R. 1988 (OBS)

Dates Last Seen
Element: 2003-05-23
Site: 2003-05-23
Record Last Updated: 2003-10-02

Quad Summary: SAN MATEO (3712253/448D)
County Summary: SAN MATEO

Lat/Long: 37.51359° / -122.34464°
UTM: Zone-10 N4152051 E557916
Area: 135.6 ac
Elevation: 400 ft
Mapping PrecisionSPECIFIC
Symbol Type:POLYGON
Township: 05S
Range: 04W
Section: 07 **Qtr:** XX
Meridian: M

Location: AT THE NORTHEAST END OF UPPER CRYSTAL SPRINGS RESERVOIR, PULGAS RIDGE.

Location Detail:MULTIPLE COLONIES MAPPED AS FOUR POLYGONS; PULGAS RIDGE, EAST OF THE DETENTION CENTER, WEST OF THE DETENTION CENTER, & LAKE SHORE WEST OF THE HWY 280/HWY 92 INTERCHANGE.

Ecological: ON HIGH QUALITY SERPENTINE GRASSLAND ASSOCIATED WITH ERYSIMUM FRANCISCANUM, CIRSIUM FONTINALE FONTINALE, HESPEROLINON CONGESTUM, ALLIUM BREWERI, CALOCHORTUS UMBELLATUS, MUILLA CALIFORINICA, RANUNCULUS CALIFORNICUS, & DELPHINIUM VARIEGATUM.

Threat: DRAINAGE FROM NEARBY LANDSCAPING, WEED INVASION, ROAD AND TRAIL MAINTENANCE, AND RECREATIONAL TRAIL USE THREATEN.

General: >100 PLANTS IN 1985, 100'S IN 1987, 11,000 IN 1988, 1,000'S IN 1989, ADDITIONAL COLONY OBS IN 1999, 919 IN 2000, NOT COUNTED IN 2001, PLANT OBS IN 2003. SAN FRANCISCO WATER DEPT, CALTRANS, & DFG SHARE MANAGEMNT/OWNERSHIP.

Owner/Manager: SFO CITY/COUNTY(MGMT BY SFPUC)

Occurrence No. 20 **Map Index:** 09165 **EO Index:** 22375
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: CORELLI, T. 1983 (OBS)

Dates Last Seen
Element: 1984-03-18
Site: 1984-03-18
Record Last Updated: 1995-10-20

Quad Summary: WOODSIDE (3712243/429A)
County Summary: SAN MATEO

Lat/Long: 37.46835° / -122.28296°
UTM: Zone-10 N4147071 E563406
Radius: 80 meters
Elevation: 640 ft
Mapping PrecisionSPECIFIC
Symbol Type:POINT
Township: 05S
Range: 04W
Section: 27 **Qtr:** XX
Meridian: M

Location: EDGEWOOD PARK, NORTHWEST OF REDWOOD CITY; COLONY 2.

Location Detail:MAPPED APPROX. 800 METERS SOUTHEAST OF THE CANYON SANITORIUM.

Ecological: SERPENTINE GRASSLAND; ASSOCIATED WITH STIPA LEPIDA, ALCHEMILLA, ASTRAGALUS, BAERIA, CHLOROGALUM, CLARKIA, CONVOLVULUS, DELPHINIUM, DODECATHEON, ERIOGONUM, ESCHSCHOLZIA, EVAX, LEPIDIUM, LOLIUM, LOMATIUM, LOTUS, MICROPUS, MONTIA, MUILLA, ETC.

Threat: VEHICLE TRAFFIC, HORSE TRAILS, AND PROPOSED GOLF COURSE THREATEN.

General: 50 PLANTS OBSERVED IN 1982, 35 SEEN IN 1983, AND 145 PLANTS SEEN IN 1984.

Owner/Manager: SMT COUNTY

Fritillaria liliacea

fragrant fritillary

Element Code: PMLIL0V0C0

Status		NDDB Element Ranks		Other Lists	
Federal:	None	**Global:**	G2	**CNPS List:**	1B
State:	None	**State:**	S2.2	**R-E-D Code:**	2-2-3

Habitat Associations

General: COASTAL SCRUB, VALLEY AND FOOTHILL GRASSLAND, COASTAL PRAIRIE.

Micro: OFTEN ON SERPENTINE; VARIOUS SOILS REPORTED THOUGH USUALLY CLAY, IN GRASSLAND. 3-410M.

Occurrence No. 21 **Map Index:** 09177 **EO Index:** 17657

Occ Rank: Excellent
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: EDGEWOOD CO PARK MASTER PLAN 1984 (LIT)

Dates Last Seen
Element: 1984-03-18
Site: 1984-03-18

Record Last Updated: 1995-10-20

Quad Summary: WOODSIDE (3712243/429A)

County Summary: SAN MATEO

Lat/Long:	37.46363° / -122.27830°			**Township:**	05S		
UTM:	Zone-10 N4146551 E563822			**Range:**	04W		
Area:	10.5 ac	**Mapping Precision**	SPECIFIC	**Section:**	27	**Qtr:**	XX
Elevation:	720 ft	**Symbol Type:**	POLYGON	**Meridian:**	M		

Location: EDGEWOOD PARK, NORTHWEST OF REDWOOD CITY; COLONY 1.

Location Detail: PARK IS LOCATED OF HWY 280/EDGEWOOD ROAD INTERSECTION. COLONY 1 IS 1.2 KM (0.8 MI) NORTHWEST OF THE HWY 280/CANADA ROAD INTERCHANGE.

Ecological: SERPENTINE GRASSLAND ASSOCIATED WITH STIPA LEPIDA, ACHILLEA, ANTIRRHINUM, BAERIA, CHLOROGALUM, CLARKIA, CONVOLVULUS, DELPHINIUM, DODECATHEON, ESCHSCHOLZIA, EVAX, GALIUM, LAYIA, LEPIDIUM, LINANTHUS, LOTUS, MUILLA, ORTHOCARPUS, PLANTAGO, ETC.

Threat: VEHICLE TRAFFIC, HORSE TRAILS, AND PROPOSED GOLF COURSE THREATEN.

General: 500 PLANTS OBSERVED IN 1982, 707 PLANTS SEEN IN 1983, AND 3350 PLANTS SEEN IN 1984.

Owner/Manager: SMT COUNTY

Occurrence No. 22 **Map Index:** 09158 **EO Index:** 17652

Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: CORELLI, T. 1984 (OBS)

Dates Last Seen
Element: 1984-03-18
Site: 1984-03-18

Record Last Updated: 1995-10-20

Quad Summary: WOODSIDE (3712243/429A)

County Summary: SAN MATEO

Lat/Long:	37.46245° / -122.28288°			**Township:**	05S		
UTM:	Zone-10 N4146416 E563418			**Range:**	04W		
Radius:	80 meters	**Mapping Precision**	SPECIFIC	**Section:**	27	**Qtr:**	XX
Elevation:	680 ft	**Symbol Type:**	POINT	**Meridian:**	M		

Location: EDGEWOOD PARK, NORTHWEST OF REDWOOD CITY; COLONY 3.

Location Detail: THE PARK IS LOCATED EAST OF THE HWY 280/EDGEWOOD ROAD INTERCHANGE. COLONY 3 IS APPROX. 800 METERS NORTHEAST OF THE HWY 280/CANADA ROAD INTERCHANGE.

Ecological: SERPENTINE GRASSLAND. ASSOCIATED WITH STIPA LEPIDIA, BAERIA, BRODIAEA, CHLOROGALUM, CLARKIA, DELPHINIUM, DODECATHEON, ESCHSCHOLZIA, LEPIDIUM, LOTUS, ORTHOCARPUS, PERIDERIDIA, PLANTAGO, AND SISYRINCHIUM.

Threat: VEHICLE TRAFFIC, HORSE TRAILS, AND PROPOSED GOLF COURSE ARE THREATS.

General: 200 PLANTS SEEN IN 1982, 167 PLANTS OBSERVED IN 1983, 460 PLANTS SEEN IN 1984.

Owner/Manager: SMT COUNTY

Fritillaria liliacea

fragrant fritillary

Element Code: PMLIL0V0C0

Status
Federal: None
State: None

NDDB Element Ranks
Global: G2
State: S2.2

Other Lists
CNPS List: 1B
R-E-D Code: 2-2-3

Habitat Associations
General: COASTAL SCRUB, VALLEY AND FOOTHILL GRASSLAND, COASTAL PRAIRIE.
Micro: OFTEN ON SERPENTINE; VARIOUS SOILS REPORTED THOUGH USUALLY CLAY, IN GRASSLAND. 3-410M.

Occurrence No. 35 **Map Index:** 25049 **EO Index:** 6263
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: MALLOCH, B. 1979 (OBS)

Dates Last Seen
Element: 1981-03-07
Site: 1981-03-07
Record Last Updated: 1994-02-23

Quad Summary: WOODSIDE (3712243/429A)
County Summary: SAN MATEO

Lat/Long: 37.45046° / -122.25807°
UTM: Zone-10 N4145103 E565622
Area: 13.8 ac
Elevation: 520 ft
Mapping PrecisionSPECIFIC
Symbol Type:POLYGON
Township: 05S
Range: 04W
Section: 36 **Qtr:** XX
Meridian: M

Location: FARM HILL BOULEVARD NEAR EDEN BOWER LANE, REDWOOD CITY.
Location Detail: SITE IS EAST OF FARM HILL BLVD AND SOUTH OF EDEN BOWER LAND AND EXTENDS EAST TO THE WATER TANKS.
Ecological: SERPENTINE GRASSLAND/ANNUAL GRASSLAND. ASSOCIATES INCLUDE DODECATHEON, MUILLA, AND RANUNCULUS CALIFORNICUS.
Threat: RECREATIONAL USE THREATENS.
General: APPROX. 110 PLANTS OBSERVED BY RAE IN 1979. 100+ PLANTS SEEN BY HOOPER IN 1981.
Owner/Manager: PVT

Occurrence No. 37 **Map Index:** 26631 **EO Index:** 6264
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: SILVA, T. 1931 (HERB)

Dates Last Seen
Element: 1931-03-08
Site: 1931-03-08
Record Last Updated: 1998-12-08

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

Lat/Long: 37.55173° / -122.42686°
UTM: Zone-10 N4156235 E550625
Radius: 1 mile
Elevation: 800 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT
Township: 04S
Range: 05W
Section: 29 **Qtr:** XX
Meridian: M

Location: SPRING VALLEY, HEAD OF PILARCITOS CREEK.
Location Detail: MAPPED AT PILARCITOS LAKE, THE HISTORIC HEADWATERS FOR PILARCITOS CREEK. SPRING VALLEY USUALLY REFERS TO THE AREA PRESENTLY INUNDATED BY THE CRYSTAL SPRINGS RESERVOIRS.
General: ONLY SOURCE OF INFORMATION IS 1931 COLLECTION BY SILVA. AREA SHOULD BE FIELD CHECKED FOR PRESENCE OF SUITABLE HABITAT.
Owner/Manager: UNKNOWN

Occurrence No. 55 **Map Index:** 51586 **EO Index:** 51586
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: EBERT, D. 1999 (OBS)

Dates Last Seen
Element: 1999-04-15
Site: 1999-04-15
Record Last Updated: 2003-06-19

Quad Summary: SAN MATEO (3712253/448D)
County Summary: SAN MATEO

Lat/Long: 37.51569° / -122.35629°
UTM: Zone-10 N4152276 E556885
Area: 0.5 ac
Elevation: 295 ft
Mapping PrecisionSPECIFIC
Symbol Type:POLYGON
Township: 05S
Range: 05W
Section: 12 **Qtr:** NE
Meridian: M

Location: EAST BANK OF LOWER CRYSTAL SPRINGS RESERVOIR, APPROXIMATELY 0.4 AIRMILE NNW OF HWYS 280 AND 35.
Location Detail: ONE SMALL COLONY MAPPED IN THE CENTER OF THE NW 1/4 OF SECTION 12.
General: 25 INDIVIDUALS OBSERVED IN 1999. SITE HAS NO PUBLIC ACCESS, WATER STORAGE RESERVOIR AND STATE GAME REFUGE.
Owner/Manager: SAN FRANCISCO PUC

Fritillaria liliacea

fragrant fritillary

Element Code: PMLIL0V0C0

Status		NDDB Element Ranks		Other Lists	
Federal:	None	**Global:**	G2	**CNPS List:**	1B
State:	None	**State:**	S2.2	**R-E-D Code:**	2-2-3

Habitat Associations

General: COASTAL SCRUB, VALLEY AND FOOTHILL GRASSLAND, COASTAL PRAIRIE.

Micro: OFTEN ON SERPENTINE; VARIOUS SOILS REPORTED THOUGH USUALLY CLAY, IN GRASSLAND. 3-410M.

Occurrence No. 59 **Map Index:** 26559 **EO Index:** 51598

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: SMITH, I SN JEPS #61919 (HERB)

Dates Last Seen
Element: 1915-03-15
Site: 1915-03-15

Record Last Updated: 2003-06-19

Quad Summary: SAN MATEO (3712253/448D), MONTARA MOUNTAIN (3712254/448C)

County Summary: SAN MATEO

Lat/Long: 37.56478° / -122.36552°
UTM: Zone-10 N4157717 E556033
Radius: 1 mile
Elevation: 300 ft
Mapping Precision NON-SPECIFIC
Symbol Type: POINT
Township: 04S
Range: 05W
Section: 24 **Qtr:** XX
Meridian: M

Location: HILLSBORO.

Location Detail: MAPPED NEAR THE MIDDLE OF THE CITY OF HILLSBOROUGH.

General: ONLY SOURCE OF INFORMATION IS SITE NAME FROM COLLECTION BY I. SMITH. IS THIS SPECIMEN IDENTIFIED CORRECTLY?

Owner/Manager: UNKNOWN

Geothlypis trichas sinuosa

saltmarsh common yellowthroat

Element Code: ABPBX1201A

Status		NDDB Element Ranks		Other Lists	
Federal:	None	**Global:**	G5T2	**CDFG Status:**	SC
State:	None	**State:**	S2		

Habitat Associations

General: RESIDENT OF THE SAN FRANCISCO BAY REGION, IN FRESH AND SALT WATER MARSHES.

Micro: REQUIRES THICK, CONTINUOUS COVER DOWN TO WATER SURFACE FOR FORAGING; TALL GRASSES, TULE PATCHES, WILLOWS FOR NESTING.

Occurrence No. 5 **Map Index:** 08660 **EO Index:** 24856

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: FOSTER, M. 1977 (LIT)

Dates Last Seen
Element: 1975-XX-XX
Site: 1975-XX-XX
Record Last Updated: 2005-02-02

Quad Summary: MONTARA MOUNTAIN (3712254/448C), SAN FRANCISCO SOUTH (3712264/448B)

County Summary: SAN MATEO

Lat/Long: 37.62241° / -122.48598°
UTM: Zone-10 N4164046 E545359
Radius: 3/5 mile
Elevation: 300 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT
Township: 03S
Range: 06W
Section: 35 **Qtr:** XX
Meridian: M

Location: SHARP PARK.

Location Detail:TWO PAIRS NESTING IN A 10 ACRE MARSH DURING 1975.

Owner/Manager: UNKNOWN

Occurrence No. 47 **Map Index:** 08996 **EO Index:** 24817

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: U.S. FISH & WILDLIFE SERVICE 1986 (LIT)

Dates Last Seen
Element: 1985-XX-XX
Site: 1985-XX-XX
Record Last Updated: 1996-01-11

Quad Summary: WOODSIDE (3712243/429A)

County Summary: SAN MATEO

Lat/Long: 37.49632° / -122.34525°
UTM: Zone-10 N4150134 E557876
Radius: 1/5 mile
Elevation: 338 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT
Township: 05S
Range: 04W
Section: 18 **Qtr:** NE
Meridian: M

Location: UPPER CRYSTAL SPRINGS RESERVOIR, MARSH WEST OF ADOBE POINT. MANAGED BY SAN FRANCISCO WATER DEPARTMENT.

Ecological: HABITAT IS FRESHWATER MARSH, DENSE STANDS OF WILLOWS AND UPLAND VEG. WATER LEVEL VARIES FROM YEAR TO YEAR. SOURCE IS FROM HETCH HETCHY RESERVOIR.

General: 8 BREEDING PAIRS OBS IN 1985.

Owner/Manager: SFO CITY/COUNTY(MGMT BY SFPUC)

Occurrence No. 48 **Map Index:** 09021 **EO Index:** 24816

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: U.S. FISH & WILDLIFE SERVICE 1986 (LIT)

Dates Last Seen
Element: 1985-XX-XX
Site: 1985-XX-XX
Record Last Updated: 2005-02-11

Quad Summary: WOODSIDE (3712243/429A)

County Summary: SAN MATEO

Lat/Long: 37.48562° / -122.33152°
UTM: Zone-10 N4148956 E559098
Radius: 1/10 mile
Elevation: 292 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT
Township: 05S
Range: 04W
Section: 20 **Qtr:** NW
Meridian: M

Location: SOUTHWEST SIDE OF UPPER CRYSTAL SPRINGS RESERVOIR, 2 MILES SOUTH OF HWY 32.

Location Detail:ALONG OLD CANADA ROAD.

Ecological: HABITAT IS RIPARIAN WOODLAND CONTAINING VERY DENSE STANDS OF WILLOWS WITH FRESHWATER MARSH AND UPLAND VEGETATION. WATER LEVEL VARIES FROM YEAR TO YEAR. SOURCE IS HETCH HETCHY RESERVOIR.

General: 3 BREEDING PAIRS OBS DURING 1985 SURVEY. MANAGED BY SAN FRANCISCO WATER DEPARTMENT.

Owner/Manager: SFO CITY/COUNTY(MGMT BY SFPUC)

Geothlypis trichas sinuosa

saltmarsh common yellowthroat

Element Code: ABPBX1201A

Status
Federal: None
State: None

NDDB Element Ranks
Global: G5T2
State: S2

Other Lists
CDFG Status: SC

Habitat Associations
General: RESIDENT OF THE SAN FRANCISCO BAY REGION, IN FRESH AND SALT WATER MARSHES.
Micro: REQUIRES THICK, CONTINUOUS COVER DOWN TO WATER SURFACE FOR FORAGING; TALL GRASSES, TULE PATCHES, WILLOWS FOR NESTING.

Occurrence No. 49 **Map Index:** 09051 **EO Index:** 24814
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: U.S. FISH & WILDLIFE SERVICE 1986 (LIT)

Dates Last Seen
Element: 1985-XX-XX
Site: 1985-XX-XX
Record Last Updated: 2005-02-11

Quad Summary: WOODSIDE (3712243/429A)
County Summary: SAN MATEO

Lat/Long: 37.48139° / -122.32063°
UTM: Zone-10 N4148493 E560064
Area: 62.9 ac
Elevation: 320 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POLYGON
Township: 05S
Range: 04W
Section: 20 **Qtr:** E
Meridian: M

Location: UPPER CRYSTAL SPRINGS RESERVOIR, SOUTH END NEAR PULGAS WATER TEMPLE.

Ecological: HABITAT IS RIPARIAN WOODLAND CONTAINING VERY DENSE STANDS OF WILLOWS WITH FRESHWATER MARSH AND UPLAND VEGETATION. WATER LEVEL IS VARIABLE. SOURCE IS HETCH HETCHY RESERVOIR.

General: 13 BREEDING PAIRS OBSERVED DURING 1985 SURVEY.

Owner/Manager: SFO CITY/COUNTY(MGMT BY SFPUC)

Occurrence No. 57 **Map Index:** 08554 **EO Index:** 24807
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: U.S. FISH & WILDLIFE SERVICE 1986 (LIT)

Dates Last Seen
Element: 1990-05-22
Site: 1990-07-01
Record Last Updated: 1991-08-21

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

Lat/Long: 37.50494° / -122.49469°
UTM: Zone-10 N4151009 E544661
Radius: 1/5 mile
Elevation: 25 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT
Township: 05S
Range: 05W
Section: 11 **Qtr:** XX
Meridian: M

Location: PRINCETON MARSH, W OF PRINCETON AND S OF HALF MOON BAY AIRPORT.

Location Detail:COUNTY SUED AFTER ILLEGAL HABITAT DESTRUCTION IN 1989.

Ecological: HABITAT CONSISTS OF CATTAIL/TULE MARSH SURROUNDED BY A DENSE THICKET OF WILLOWS. MARSH WAS DRY IN MID-JUNE 1988.

Threat: 12 CAR PARKING LOT BUILT IN 1989 & SOME HABITAT DESTROYED; OFFICE BUILDING PLANNED FOR THIS SITE.

General: 3 BREEDING PAIRS OBS DURING 1985 SURVEY; 3 ADULTS OBS ON 05-07-88, NOT OBS ON 8 JUL 1988; 2 PR NESTED IN 1989, SUCCESS UNKNOWN. IN 1990, NESTING ATTEMPTED, NO BIRDS OBS AFTER MAY 22.

Owner/Manager: PVT

Occurrence No. 79 **Map Index:** 59806 **EO Index:** 59842
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: BURTON, K. 2001 (OBS)

Dates Last Seen
Element: 2001-08-20
Site: 2001-08-20
Record Last Updated: 2005-02-02

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

Lat/Long: 37.61624° / -122.44311°
UTM: Zone-10 N4163384 E549146
Area: 40.0 ac
Elevation: 480 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POLYGON
Township: 04S
Range: 05W
Section: 06 **Qtr:** XX
Meridian: M

Location: NORTH OF SAN ANDREAS LAKE, GOLDEN GATE NATIONAL RECREATION AREA.

Location Detail:AREA MAPPED USING UTM COORDINATES AND DETECTION LOCATIONS SHOWN ON MAP.

Ecological: FRESHWATER EMERGENT WETLAND ADJACENT TO COASTAL SCRUB AND EUCALYPTUS.

Threat: FERAL CATS

General: 3 DETECTED ON 20 AUG 2001. THIS WATERSHED IS NOT OPEN TO THE PUBLIC. RESIDENTIAL NEARBY.

Owner/Manager: CITY OF SF, SFO COUNTY

Grindelia hirsutula var. maritima

San Francisco gumplant

Element Code: PDAST470D3

Status
Federal: None
State: None

NDDB Element Ranks
Global: G5T2
State: S2.1

Other Lists
CNPS List: 1B
R-E-D Code: 2-2-3

Habitat Associations
General: COASTAL SCRUB, COASTAL BLUFF SCRUB, VALLEY AND FOOTHILL GRASSLAND.
Micro: SANDY OR SERPENTINE SLOPES, SEA BLUFFS. 15-400M.

Occurrence No. 11 **Map Index:** 08503 **EO Index:** 16946
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: HOWE, D. SN SD #88348 (HERB)

Dates Last Seen
Element: 1972-06-25
Site: 1985-09-08

Record Last Updated: 1989-08-11

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

Lat/Long: 37.55910° / -122.51332°
UTM: Zone-10 N4157009 E542983
Radius: 1 mile
Elevation: 200 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT
Township: 04S
Range: 06W
Section: 28 **Qtr:** XX
Meridian: M

Location: OCEAN BLUFF, 7.5 MI N OF HALF MOON BAY.
Ecological: OCEAN BLUFF.

Owner/Manager: DPR

Hesperolinon congestum

Marin western flax

Element Code: PDLIN01060

Status
Federal: Threatened
State: Threatened

NDDB Element Ranks
Global: G2
State: S2.1

Other Lists
CNPS List: 1B
R-E-D Code: 3-3-3

Habitat Associations
General: CHAPARRAL, VALLEY AND FOOTHILL GRASSLAND.
Micro: IN SERPENTINE BARRENS AND IN SERPENTINE GRASSLAND AND CHAPARRAL. 30-365M.

Occurrence No. 1 **Map Index:** 08948 **EO Index:** 9053
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: CORELLI, T. 1991 (OBS)

Dates Last Seen
Element: 1997-XX-XX
Site: 1997-XX-XX
Record Last Updated: 1998-04-14

Quad Summary: SAN MATEO (3712253/448D)
County Summary: SAN MATEO

Lat/Long: 37.54508° / -122.36763°
UTM: Zone-10 N4155530 E555861
Area: 57.3 ac
Elevation: 525 ft
Mapping PrecisionSPECIFIC
Symbol Type:POLYGON
Township: 04S
Range: 05W
Section: 36 **Qtr:** XX
Meridian: M

Location: RIDGE ABOVE LOWER CRYSTAL SPRINGS RESERVOIR, SOUTH BURI BURI RIDGE, BOTH SIDES JUNIPERO SERRA FREEWAY (I-280).

Location Detail: N AND S OF HWY 280 AND BETWEEN SKYLINE BLVD AND I-280. MANAGED BY SAN FRANCISCO WATER DEPARTMENT.

Ecological: IN SERPENTINE BARRENS AND BUNCHGRASS ON SHALLOW SOIL WITH NASSELLA PULCHRA, CHLOROGALUM POMERIDIANUM, ACHILLEA MILLEFOLIUM, CLARKIA PURPUREA, PLANTAGO ERECTA, AND FRITILLARIA BIFLORA.

Threat: PLAN EXISTS TO PUT A TRAIL SYSTEM WITHIN THE SF WATERSHED LAND. NONNATIVE PLANTS THREATEN HABITAT BTWN I-280 & SKYLINE.

General: LESS THAN 50 PLANTS IN 1981; MORE THAN 75 IN 1986. SOME PLANTS FENCED WITHIN RESERVOIR BOUNDARY. 500 PLANTS SEEN IN 1989. OCCURRENCE EXPANDED IN 1992 TO INCLUDE SEVERAL POLYGONS W/ABOUT 1100 TOTAL PLANTS.

Owner/Manager: SFO CITY/COUNTY(MGMT BY SFPUC)

Occurrence No. 2 **Map Index:** 08956 **EO Index:** 9082
Occ Rank: None
Origin: Natural/Native occurrence
Presence: Extirpated
Trend: Decreasing
Main Source: THOMAS, J. #9379 RSA, DS, UC (HERB)

Dates Last Seen
Element: 1961-05-14
Site: 1989-05-17
Record Last Updated: 1996-01-11

Quad Summary: SAN MATEO (3712253/448D)
County Summary: SAN MATEO

Lat/Long: 37.52914° / -122.36280°
UTM: Zone-10 N4153765 E556300
Radius: 80 meters
Elevation: 400 ft
Mapping PrecisionSPECIFIC
Symbol Type:POINT
Township: 05S
Range: 05W
Section: 1 **Qtr:** XX
Meridian: M

Location: ROAD BANK AND SERPENTINE OUTCROP JUST NORTH OF CRYSTAL SPRINGS DAM ON SAN MATEO CREEK.

Location Detail: MANAGED BY SAN FRANCISCO WATER DEPARTMENT.

Ecological: SERPENTINE OUTCROP.

Threat: ROAD CONSTRUCTION.

General: IN 1979, ROAD CONSTRUCTION GREATLY ALTERED AREA AND PLANT WAS NOT FOUND. NO HABITAT REMAINING IN 1986; ROAD WAS EXPANDED. PLANT CONSIDERED EXTIRPATED THIS SITE.

Owner/Manager: SFO CITY/COUNTY(MGMT BY SFPUC)

Hesperolinon congestum

Marin western flax

Element Code: PDLIN01060

Status

Federal: Threatened
State: Threatened

NDDB Element Ranks

Global: G2
State: S2.1

Other Lists

CNPS List: 1B
R-E-D Code: 3-3-3

Habitat Associations

General: CHAPARRAL, VALLEY AND FOOTHILL GRASSLAND.
Micro: IN SERPENTINE BARRENS AND IN SERPENTINE GRASSLAND AND CHAPARRAL. 30-365M.

Occurrence No. 3 **Map Index:** 08980 **EO Index:** 8499
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Fluctuating
Main Source: VONARB, R. 1988 (OBS)

Dates Last Seen
Element: 1996-05-21
Site: 1996-05-21
Record Last Updated: 1998-04-14

Quad Summary: SAN MATEO (3712253/448D)
County Summary: SAN MATEO

Lat/Long: 37.51638° / -122.34614°
UTM: Zone-10 N4152359 E557782
Area: 196.7 ac
Elevation: 350 ft
Mapping PrecisionSPECIFIC
Symbol Type:POLYGON
Township: 05S
Range: 04W
Section: 7 **Qtr:** XX
Meridian: M

Location: PULGAS RIDGE, FROM NEAR HIGHLANDS SCHOOL TO S OF HILLCREST DETENTION HOME.

Location Detail: E SIDE UPPER CRYSTAL SPRINGS RESERVOIR. BOTH SIDES OF I-280. WITHIN SAN FRANCISCO WATERSHED LAND, SO SOMEWHAT PROTECTED.

Ecological: ON GENTLE SLOPE W/SERPENTINE OUTCROPPINGS W/STIPA SP., ALLIUM BREWERI, PLANTAGO ERECTA, BRODIAEA SPP., DELPHINIUM VARIEGATUM, FRITILLARIA LILIACEA, CALOCHORTUS UMBELLATUS, ERYSIMUM FRANCISCANUM FRANCISCANUM, & CIRSIUM FONTINALE FONTINALE.

Threat: UPPER SLOPE DISTURBED BY ROAD BUILDING AND INVASIVE WEEDS. CONTINUED USE OF CANADA ROAD BIKING/HIKING TRAILS THREATENS.

General: TOTAL OF OVER 16,500 PLANTS SEEN 1988-1989, 10,300 IN `95, 5170 IN `96.

Owner/Manager: SFO CITY/COUNTY(MGMT BY SFPUC)

Occurrence No. 4 **Map Index:** 09180 **EO Index:** 7809
Occ Rank: Excellent
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: CORELLI, T. 1983 (OBS)

Dates Last Seen
Element: 1997-XX-XX
Site: 1997-XX-XX
Record Last Updated: 1998-04-14

Quad Summary: WOODSIDE (3712243/429A)
County Summary: SAN MATEO

Lat/Long: 37.46330° / -122.27793°
UTM: Zone-10 N4146514 E563855
Radius: 80 meters
Elevation: 700 ft
Mapping PrecisionSPECIFIC
Symbol Type:POINT
Township: 05S
Range: 04W
Section: 26 **Qtr:** XX
Meridian: M

Location: EDGEWOOD COUNTY PARK, APPROX 0.75 AIR MI WSW OF LOWER EMERALD LAKE.

Ecological: SERPENTINE GRASSLAND W/NASSELLA PULCHRA, SITANION JUBATUM, CHLOROGALUM POMERIDIANUM, BRODIAEA TERRESTRIS, & ERIOGONUM VIMINIUM. RARE SPECIES INCLUDE FRITILLARIA LILIACEA, ACANTHOMINTHA DUTTONII & BAY AREA CHECKERSPOT BUTTERFLY.

Threat: SITE WAS BEING CONSIDERED FOR GOLF COURSE, BUT PLAN HAS BEEN ABANDONED. BENCH MAY BE PLANNED FOR THIS SITE.

General: MORE THAN 800 PLANTS SEEN IN 1986, 2000 IN 1992. GOOD TO EXCELLENT SITE QUALITY. ENSEMBLE OF RARE PLANTS AND INVERTEBRATES. PROPOSED GOLF COURSE WOULD IMPACT 100 ACRES OF PRISTINE SERPENTINE GRASSLAND.

Owner/Manager: SMT COUNTY

Hesperolinon congestum

Marin western flax

Element Code: PDLIN01060

Status		NDDB Element Ranks		Other Lists	
Federal:	Threatened	**Global:**	G2	**CNPS List:**	1B
State:	Threatened	**State:**	S2.1	**R-E-D Code:**	3-3-3

Habitat Associations

General: CHAPARRAL, VALLEY AND FOOTHILL GRASSLAND.

Micro: IN SERPENTINE BARRENS AND IN SERPENTINE GRASSLAND AND CHAPARRAL. 30-365M.

Occurrence No. 5 **Map Index:** 09236 **EO Index:** 18631

Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: LINDENMEYER, T. 1981 (OBS)

Dates Last Seen
Element: 1986-05-20
Site: 1986-05-20

Record Last Updated: 1998-04-14

Quad Summary: PALO ALTO (3712242/428B), WOODSIDE (3712243/429A)

County Summary: SAN MATEO

Lat/Long: 37.44187° / -122.25358°
UTM: Zone-10 N4144154 E566027
Radius: 1/5 mile
Elevation: 520 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT
Township: 06S
Range: 04W
Section: 1 **Qtr:** XX
Meridian: M

Location: WOODSIDE GLENS, BETW I-280 AND CANADA ROAD (KITE HILL).

Location Detail:THIS AREA SET ASIDE FOR MITIGATION FOR BAY CHECKERSPOT BUTTERFLY (WHICH HAS DISAPPEARED FROM THIS SITE). SITE GETTING GRASSIER FORM WATER RUNOFF FROM HOMES UPSLOPE.

Ecological: SERPENTINE GRASSLAND; ASSOCIATED WITH STIPA. FRITILLARIA LILIACEA OCCURS NEARBY.

Threat: VULNERABLE TO DEVELOPMENT. SITE NOT FENCED (1988); PVT RESIDENCE ACROSS THE ST, SUSCEPTIBLE TO DUMPING, EROSION, RUNOFF.

General: BETWEEN 1000-1500 PLANTS IN 1981; 175 IN 1986 IN OPEN AREA NOT TO BE DEVELOPED.

Owner/Manager: PVT

Occurrence No. 17 **Map Index:** 09154 **EO Index:** 20708

Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: CORELLI, T. 1983 (OBS)

Dates Last Seen
Element: 1992-05-17
Site: 1992-05-17

Record Last Updated: 1998-04-14

Quad Summary: WOODSIDE (3712243/429A)

County Summary: SAN MATEO

Lat/Long: 37.46293° / -122.28443°
UTM: Zone-10 N4146469 E563280
Radius: 80 meters
Elevation: 600 ft
Mapping PrecisionSPECIFIC
Symbol Type:POINT
Township: 05S
Range: 04W
Section: 27 **Qtr:** XX
Meridian: M

Location: EDGEWOOD COUNTY PARK, APPROX 1.2 AIRMI WSW OF LOWER EMERALD LAKE.

Ecological: WEST-FACING SLOPE IN SERPENTINE GRASSLAND; ASSOCIATED WITH NASSELLA PULCHRA, SITANION JUBATUM, CHLOROGALUM POMERIDIANUM, ERIOGONUM VIMINIUM, MIMULUS DOUGLASII, AND BRODIAEA TERRESTRIS.

Threat: TRAIL USE IS A POTENTIAL THREAT. NO LONGER THREATENED BY GOLF COURSE DEVELOPMENT.

General: LESS THAN 3000 PLANTS SEEN IN 1983, 30-50 IN 1987, 900 IN 1992. OTHER RARE SPECIES NEARBY INCLUDE FRITILLARIA LILACEA, PENTACHAETA BELLIDIFLORA, AND BAY AREA CHECKERSPOT BUTTERFLY.

Owner/Manager: SMT COUNTY

Hesperolinon congestum

Marin western flax

Element Code: PDLIN01060

Status		NDDB Element Ranks		Other Lists	
Federal:	Threatened	**Global:**	G2	**CNPS List:**	1B
State:	Threatened	**State:**	S2.1	**R-E-D Code:**	3-3-3

Habitat Associations

General: CHAPARRAL, VALLEY AND FOOTHILL GRASSLAND.

Micro: IN SERPENTINE BARRENS AND IN SERPENTINE GRASSLAND AND CHAPARRAL. 30-365M.

Occurrence No. 18 **Map Index:** 09224 **EO Index:** 17732

Occ Rank: None
Origin: Natural/Native occurrence
Presence: Extirpated
Trend: Unknown
Main Source: MCCLINTOCK, E. NO DATE (PERS)

Dates Last Seen
Element: XXXX-XX-XX
Site: 1986-05-20
Record Last Updated: 1993-04-26

Quad Summary: WOODSIDE (3712243/429A)
County Summary: SAN MATEO

Lat/Long: 37.44994° / -122.25835°
UTM: Zone-10 N4145045 E565599
Area: 6.9 ac
Elevation: 550 ft
Mapping PrecisionSPECIFIC
Symbol Type:POLYGON
Township: 05S
Range: 04W
Section: 36 **Qtr:** XX
Meridian: M

Location: NORTHEAST OF CANADA COLLEGE, REDWOOD CITY.

Threat: DEVELOPMENT.

General: OCCURRENCE EXTIRPATED BY CONSTRUCTION OF A CHURCH.

Owner/Manager: PVT

Occurrence No. 21 **Map Index:** 08964 **EO Index:** 9076

Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: MCCARTEN, N. 1987 (OBS)

Dates Last Seen
Element: 1987-06-23
Site: 1987-06-23
Record Last Updated: 1998-04-14

Quad Summary: SAN MATEO (3712253/448D)
County Summary: SAN MATEO

Lat/Long: 37.54087° / -122.35913°
UTM: Zone-10 N4155068 E556615
Radius: 80 meters
Elevation: 480 ft
Mapping PrecisionSPECIFIC
Symbol Type:POINT
Township: 04S
Range: 05W
Section: 36 **Qtr:** XX
Meridian: M

Location: WSW SLOPE OF BLACK MTN IN HILLSBOROUGH HIGHLANDS ESTATES ON N SIDE OF MORSE RD.

Location Detail: PLANTS FOUND BETWEEN DRIVEWAY AND ROAD.

Ecological: IN SEPENTINE BUNCHGRASS GRASSLAND ON SERPENTINE SOIL. SURROUNDED BY COAST OAK WOODLAND.

Threat: DEVELOPMENT MAY THREATEN; SITE IS SUBJECT TO EROSION.

General: 44 PLANTS IN 1987. AREA MAY BE SET ASIDE FOR OPEN SPACE.

Owner/Manager: PVT

Occurrence No. 22 **Map Index:** 21189 **EO Index:** 9077

Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: HIMES, K. 1988 (OBS)

Dates Last Seen
Element: 1988-04-06
Site: 1988-04-06
Record Last Updated: 1996-01-11

Quad Summary: SAN MATEO (3712253/448D)
County Summary: SAN MATEO

Lat/Long: 37.53245° / -122.35334°
UTM: Zone-10 N4154138 E557133
Radius: 80 meters
Elevation: 200 ft
Mapping PrecisionSPECIFIC
Symbol Type:POINT
Township: 04S
Range: 04W
Section: 1 **Qtr:** XX
Meridian: M

Location: ALONG CRYSTAL SPRINGS ROAD, ABOUT 200 YDS WEST OF INTERSECTION OF CRYSTAL SPRINGS ROAD AND POLHEMUS ROAD.

Location Detail: N SIDE OF ROAD. MAJOR PIPELINE IS EXPOSED JUST BELOW THE COLONY WHERE THE PIPELINE CROSSES A SMALL STREAM. MANAGED BY SAN FRANCISCO WATER DEPARTMENT.

Ecological: AT BASE OF S-FACING SLOPE AT THE TOP OF ROADSIDE BANK. ON SERPENTINE OUTCROP IN SERPENTINE BUNCHGRASS WITHIN COAST LIVE OAK-CALIFORNIA BAY ASSOCIATION.

Threat: REPAIR OR NEW CONSTRUCTION OF PIPELINE WOULD THREATEN. A TRAIL USED BY RESIDENTS IS VERY CLOSE TO THE COLONY.

General: 57 PLANTS SEEN IN 1988.

Owner/Manager: SFO CITY/COUNTY(MGMT BY SFPUC)

Hydrochara rickseckeri

Ricksecker's water scavenger beetle

Element Code: IICOL5V010

Status
Federal: None
State: None

NDDB Element Ranks
Global: G1G2
State: S1S2

Other Lists
CDFG Status:

Habitat Associations
General: AQUATIC.
Micro:

Occurrence No. 1 **Map Index:** 09060 **EO Index:** 22635
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: EDWARDS, K. 1985 (LIT)

Dates Last Seen
Element: 1954-02-25
Site: 1954-02-25
Record Last Updated: 2005-03-21

Quad Summary: WOODSIDE (3712243/429A)
County Summary: SAN MATEO

Lat/Long: 37.48382° / -122.31775°
UTM: Zone-10 N4148765 E560317
Radius: 1/5 mile
Elevation: 280 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT
Township: 05S
Range: 04W
Section: 20 **Qtr:** XX
Meridian: M

Location: PULGAS WATER TEMPLE, AT THE SOUTH END OF UPPER CRYSTAL SPRINGS RESERVOIR, 4 MILES NW OF REDWOOD CITY.

Location Detail: MANAGED BY SAN FRANCISCO WATER DEPARTMENT.

Ecological: MEMBERS OF THE FAMILY HYDROPHILIDAE ARE SCAVENGERS, WHOSE AQUATIC LARVAE ARE PREDACEOUS; NOTHING IS KNOWN ABOUT HABITS SPECIFIC TO THIS TAXA.

Threat: THREATS INCLUDE LOSS OF HABITAT TO DEVELOPMENT.

Owner/Manager: SFO CITY/COUNTY(MGMT BY SFPUC)

Occurrence No. 6 **Map Index:** 43750 **EO Index:** 60691
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: HAFERNIK, J. 1989 (LIT)

Dates Last Seen
Element: 1950-03-14
Site: 1950-03-14
Record Last Updated: 2005-03-21

Quad Summary: SAN MATEO (3712253/448D)
County Summary: SAN MATEO

Lat/Long: 37.56330° / -122.32206°
UTM: Zone-10 N4157580 E559872
Radius: 1 mile
Elevation: 22 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT
Township: 04S
Range: 04W
Section: 20 **Qtr:** XX
Meridian: M

Location: SAN MATEO.

Location Detail: EXACT LOCALITY UNKNOWN

General: 1 COLLECTED BY R.S. BEAL 14 MAR 1950. MUSEUM LABEL DATA CITED IN APPENDIX OF HAFERNIK REPORT.

Owner/Manager: UNKNOWN

Ischnura gemina

San Francisco Forktail Damselfly

Element Code: IIODO72010

Status

Federal: None
State: None

NDDB Element Ranks

Global: G2
State: S2

Other Lists

CDFG Status:

Habitat Associations

General: ENDEMIC TO THE SAN FRANCISCO BAY AREA.
Micro: SMALL, MARSHY PONDS AND DITCHES WITH EMERGENT ANF FLOATING AQUATIC VEGETATION.

Occurrence No. 1
Map Index: 09064
EO Index: 60773
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: BIGGS, K. 1999 (PERS)

Dates Last Seen

Element: 1999-05-17
Site: 1999-05-17
Record Last Updated: 2005-03-30

Quad Summary: SAN MATEO (3712253/448D)
County Summary: SAN MATEO

Lat/Long: 37.58993° / -122.32163°
UTM: Zone-10 N4160535 E559889
Radius: 1/5 mile
Elevation: 50 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT
Township: 04S
Range: 04W
Section: 17
Qtr: XX
Meridian: M

Location: COYOTE POINT, AIRPORT BLVD.

General: UNKNOWN NUMBER COLLECTED/OBSERVED ON 17 MAY 1999

Owner/Manager: SMT COUNTY

Laterallus jamaicensis coturniculus

California black rail

Element Code: ABNME03041

Status		NDDB Element Ranks		Other Lists	
Federal:	None	**Global:**	G4T1	**CDFG Status:**	
State:	Threatened	**State:**	S1		

Habitat Associations

General: MAINLY INHABITS SALT-MARSHES BORDERING LARGER BAYS.

Micro: OCCURS IN TIDAL SALT MARSH HEAVILY GROWN TO PICKLEWEED; ALSO IN FRESH-WATER AND BRACKISH MARSHES, ALL AT LOW ELEVATION.

Occurrence No. 12 **Map Index:** 09280 **EO Index:** 30100

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: MANOLIS, T. 1977 (LIT)

Dates Last Seen
Element: 1972-08-XX
Site: 1977-XX-XX

Record Last Updated: 1999-11-04

Quad Summary: REDWOOD POINT (3712252/447C), SAN MATEO (3712253/448D)

County Summary: SAN MATEO

Lat/Long: 37.54174° / -122.25080°
UTM: Zone-10 N4155235 E566185
Area: 514.5 ac
Elevation: 15 ft

Mapping PrecisionSPECIFIC
Symbol Type:POLYGON

Township: 04S
Range: 03W
Section: 36 **Qtr:** XX
Meridian: M

Location: BELMONT SLOUGH.

General: ONE RAIL OBSERVED IN 1972. RAILS WERE NOT FOUND IN THE SOUTH BAY IN 1977 SURVEY. LACK OF SUITABLE HABITAT (HIGH MARSH) PROBABLY PREVENTS NESTING IN THIS REGION.

Owner/Manager: UNKNOWN

Leptosiphon croceus

coast yellow leptosiphon

Element Code: PDPLM09170

Status
Federal: None
State: None

NDDB Element Ranks
Global: G1
State: S1.1

Other Lists
CNPS List: 1B
R-E-D Code: 3-3-3

Habitat Associations
General: COASTAL BLUFF SCRUB, COASTAL PRAIRIE.
Micro: 10-150M.

Occurrence No. 2 **Map Index:** 46039 **EO Index:** 46039
Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: CORELLI, T. 1999 (OBS)

Dates Last Seen
Element: 1999-05-31
Site: 1999-05-31
Record Last Updated: 2001-10-10

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

Lat/Long: 37.52985° / -122.51713°
UTM: Zone-10 N4153762 E542664
Area: 1.1 ac
Elevation: 500 ft
Mapping PrecisionSPECIFIC
Symbol Type:POLYGON
Township: 05S
Range: 06W
Section: 03 **Qtr:** NW
Meridian: M

Location: VALLEMAR BLUFF, MOSS BEACH, 50 M NW OF END OF JULIANA AVE.
Location Detail:ON A CLIFF JUST ABOVE THE BEACH, POP EXTENDS TO THE BLUFF EDGE AND TO A DRAINAGE THAT RUNS ALONG ONE SIDE IN THIS AREA.
Ecological: COASTAL TERRACE BLUFF, COASTAL PRAIRIE, WITH ARMERIA MARITIMA SSP CALIFORNICA, POACEAE SP, ERIOGONUM LATIFOLIUM, ERYNGIUM ARMATUM, PLANTAGO SP.
Threat: EXISTING AND NEW DEVELOPMENT NEARBY, FOOT TRAFFIC FROM BENCH AND TRAILS, SMALL POPULATION SIZE (50X50' AREA).
General: 400-500 PLANTS SEEN IN 1999, 1000 PLANTS SEEN IN 1998, MAPPED WITH ONE OTHER FIELD SURVEY FORM FROM 1998 BY R. BATTAGLIA.
Owner/Manager: SMT COUNTY-FITZGERALD MR, DFG

Occurrence No. 3 **Map Index:** 46040 **EO Index:** 46040
Occ Rank: None
Origin: Natural/Native occurrence
Presence: Possibly Extirpated
Trend: Unknown
Main Source: BLENHEIM SN UNK HERB (HERB)

Dates Last Seen
Element: 1903-XX-XX
Site: 1903-XX-XX
Record Last Updated: 2001-10-03

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

Lat/Long: 37.59393° / -122.51908°
UTM: Zone-10 N4160871 E542455
Radius: 1 mile
Elevation:
Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT
Township: 04S
Range: 06W
Section: 10 **Qtr:** XX
Meridian: M

Location: NEAR POINT SAN PEDRO.
Location Detail:THREE COLLECTIONS MAPPED TOGETHER AS BEST GUESS AT PT SAN PEDRO BY CNDDB.
General: TYPE LOCALITY. POSSIBLY EXTIRPATED.
Owner/Manager: UNKNOWN

Leptosiphon rosaceus

rose leptosiphon

Element Code: PDPLM09180

Status
Federal: None
State: None

NDDB Element Ranks
Global: G1
State: S1.1

Other Lists
CNPS List: 1B
R-E-D Code: 3-3-3

Habitat Associations
General: COASTAL BLUFF SCRUB.
Micro: 0-100M.

Occurrence No. 3 **Map Index:** 46063 **EO Index:** 46063
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: VASEY, M. 1999 (PERS)

Dates Last Seen
Element: 1999-05-31
Site: 1999-05-31
Record Last Updated: 2001-10-15

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

Lat/Long: 37.62011° / -122.49787°
UTM: Zone-10 N4163785 E544312
Area: 5.9 ac
Elevation:
Mapping PrecisionNON-SPECIFIC
Symbol Type:POLYGON
Township: 03S
Range: 06W
Section: 35 **Qtr:** XX
Meridian: M

Location: MORI POINT, PACIFICA.
Location Detail: STEEP N-FACING SLOPE ABOVE OCEAN.
Threat: EROSION, VERY SMALL POPULATION (30 X 20 M).
General: 500 PLANTS SEEN IN 1999, NEEDS FIELDWORK TO GET PRECISE LOCATION INFORMATION.
Owner/Manager: UNKNOWN

Occurrence No. 4 **Map Index:** 08497 **EO Index:** 46064
Occ Rank: None
Origin: Natural/Native occurrence
Presence: Possibly Extirpated
Trend: Unknown
Main Source: ANONYMOUS SN UNK HERB (HERB)

Dates Last Seen
Element: 1935-05-XX
Site: 1935-05-XX
Record Last Updated: 2001-10-09

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

Lat/Long: 37.52626° / -122.51227°
UTM: Zone-10 N4153366 E543095
Radius: 2/5 mile
Elevation: 25 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT
Township: 05S
Range: 06W
Section: 03 **Qtr:** XX
Meridian: M

Location: MOSS BEACH.
General: NEEDS FIELDWORK, POSSIBLY EXTIRPATED.
Owner/Manager: UNKNOWN

Occurrence No. 5 **Map Index:** 46065 **EO Index:** 46065
Occ Rank: None
Origin: Natural/Native occurrence
Presence: Possibly Extirpated
Trend: Unknown
Main Source: ANONYMOUS SN UNK HERB (HERB)

Dates Last Seen
Element: 1950-04-XX
Site: 1950-04-XX
Record Last Updated: 2001-10-09

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

Lat/Long: 37.53633° / -122.51942°
UTM: Zone-10 N4154480 E542458
Radius: 1/5 mile
Elevation:
Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT
Township: 04S
Range: 06W
Section: 34 **Qtr:** XX
Meridian: M

Location: MONTARA POINT.
Location Detail: TWO COLLECTIONS MAPPED TOGETHER AS BEST GUESS AT MONTARA POINT BY CNDDB.
General: INCLUDES ONE OTHER COLLECTION FROM 1903, POSSIBLY EXTIRPATED.
Owner/Manager: UNKNOWN

Lessingia arachnoidea

Crystal Springs lessingia

Element Code: PDAST5S0C0

Status		NDDB Element Ranks		Other Lists	
Federal:	None	**Global:**	G1	**CNPS List:**	1B
State:	None	**State:**	S1.2	**R-E-D Code:**	3-2-3

Habitat Associations

General: COASTAL SAGE SCRUB, VALLEY AND FOOTHILL GRASSLAND, CISMONTANE WOODLAND.

Micro: GRASSY SLOPES ON SERPENTINE; SOMETIMES ON ROADSIDES. 60-200M.

Occurrence No. 1 **Map Index:** 26560 **EO Index:** 1676

Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: SMITH, S. ET AL 1994 (OBS)

Dates Last Seen
Element: 1996-07-28
Site: 1996-07-28
Record Last Updated: 1996-01-10

Quad Summary: SAN MATEO (3712253/448D)
County Summary: SAN MATEO

Lat/Long: 37.54001° / -122.37004°
UTM: Zone-10 N4154966 E555652
Area: 38.9 ac
Elevation: 500 ft
Mapping Precision SPECIFIC
Symbol Type: POLYGON
Township: 04S
Range: 05W
Section: 36 **Qtr:** XX
Meridian: M

Location: BURI BURI RIDGE, WEST OF SKYLINE BLVD ABOUT 1 MILE NORTH OF CRYSTAL SPRINGS DAM. MANAGED BY SAN FRANCISCO WATER DEPT.

Location Detail: MAPPED BETWEEN SKYLINE BLVD AND THE FLUME STARTING JUST NORTH OF WHERE THE ROAD CROSSES THE FLUME AND EXTENDING FOR ABOUT 0.5 MILE TO THE NORTH.

Ecological: SERPENTINE GRASSLAND, WITH CLARKIA RUBICUNDA, CALYCADENIA TRUNCATA, MONARDELLA, AND OTHER NATIVES. COASTAL SCRUB REGULARLY INTERRUPTS THE GRASSLAND. OTHER RARE PLANTS IN VICINITY: HESPEROLINON CONGESTUM AND FRITILLARIA BIFLORA INEZIANA.

Threat: INVASION BY VARIOUS WEEDS; ESPECIALLY YELLOW STAR THISTLE IS SERIOUS THREAT.

General: 10,000-100,000 PLANTS OBSERVED IN 1994, LARGEST KNOWN POPULATION AT THAT TIME. THOUSANDS OF PLANTS IN 1996. THE GRASSLANDS ARE IN GOOD CONDITION BUT PAMPAS GRASS OCCURS ADJACENT TO HWY 280 AND CONIFERS PLANTED BY CALTANS IN THE PAST.

Owner/Manager: SFO CITY/COUNTY(MGMT BY SFPUC)

Occurrence No. 2 **Map Index:** 26563 **EO Index:** 1672

Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: CORELLI, T. 1994 (OBS)

Dates Last Seen
Element: 1994-08-26
Site: 1994-08-26
Record Last Updated: 1996-01-10

Quad Summary: SAN MATEO (3712253/448D)
County Summary: SAN MATEO

Lat/Long: 37.51831° / -122.35388°
UTM: Zone-10 N4152568 E557096
Area: 87.5 ac
Elevation: 400 ft
Mapping Precision SPECIFIC
Symbol Type: POLYGON
Township: 05S
Range: 05W
Section: 12 **Qtr:** XX
Meridian: M

Location: PULGAS RIDGE, BOTH SIDES OF SKYLINE BLVD JUST NORTH OF JUNCTION WITH HWY 92.

Location Detail: MAPPED LARGELY BETWEEN HIGHWAY 280 AND LOWER CRYSTAL SPRINGS RESERVOIR, FROM HWY 92 NORTH FOR ABOUT 1 MILE.

Ecological: WEST-FACING SLOPES IN SERPENTINE GRASSLAND. GROWING IN ROCKY SERPENTINE AREAS WITH FEW OTHER PLANTS. OTHER PLANTS INCLUDE AVENA, ERIOGONUM NUDUM, MADIA ELEGANS, NASSELA PULCHRA, PERIDERIDIA KELLOGGII, ACHILLEA, ASTER, AND CENTAUREA.

Threat: INVASION BY WEEDY YELLOW STAR THISTLE, PLANTED CONIFERS, PAMPAS GRASS, AND FENNEL. TRAILS/ROADS ALSO THREATEN.

General: THOUSANDS OF PLANTS OBSERVED IN 1994. OTHER RARE PLANTS IN THIS AREA INCLUDE CIRSIUM FONTINALE AND HESPEROLINON CONGESTUM.

Owner/Manager: SFO CITY/COUNTY(MGMT BY SFPUC)

Lessingia arachnoidea

Crystal Springs lessingia

Element Code: PDAST5S0C0

Status — **Federal:** None — **State:** None

NDDB Element Ranks — **Global:** G1 — **State:** S1.2

Other Lists — **CNPS List:** 1B — **R-E-D Code:** 3-2-3

Habitat Associations

General: COASTAL SAGE SCRUB, VALLEY AND FOOTHILL GRASSLAND, CISMONTANE WOODLAND.

Micro: GRASSY SLOPES ON SERPENTINE; SOMETIMES ON ROADSIDES. 60-200M.

Occurrence No. 3 **Map Index:** 26565 **EO Index:** 1669

Dates Last Seen — **Element:** 1994-08-26 — **Site:** 1994-08-26

Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: SMITH, S. ET AL 1994 (OBS)
Record Last Updated: 1996-01-10

Quad Summary: SAN MATEO (3712253/448D)
County Summary: SAN MATEO

Lat/Long: 37.50476° / -122.33942°
UTM: Zone-10 N4151074 E558385
Area: 6.8 ac
Elevation: 300 ft
Mapping PrecisionSPECIFIC
Symbol Type:POLYGON
Township: 05S
Range: 05W
Section: 18 **Qtr:** XX
Meridian: M

Location: PULGAS RIDGE, WEST OF CANADA RD JUST SOUTH OF HIGHWAY 92 AS IT CROSSES HIGHWAY 280. MANAGED BY SAN FRANCISCO WATER DEPT.

Ecological: SERPENTINE GRASSLAND WITH RICH WILDFLOWER DISPLAYS IN THE SPRING. ASSOCIATED WITH PERIDERIDIA KELLOGGII, EPILOBIUM, HEMIZONIA, AND CENTAURIUM MUEHLENBERGII.

Threat: PROPOSED TRAIL MAY CROSS SITE; MAJOR THREAT IS INVASION BY WEEDS (STAR THISTLE, LACTUCA, TEASEL, FENNEL, PAMPAS GRASS).

General: SEVERAL HUNDRED PLANTS OBSERVED IN 1994. SMITH SPECULATES THAT THE ENTIRE GRASSLAND MAY BE TAKEN OVER BY YELLOW STAR THISTLE IN A FEW YEARS.

Owner/Manager: SFO CITY/COUNTY(MGMT BY SFPUC)

Occurrence No. 4 **Map Index:** 26564 **EO Index:** 1671

Dates Last Seen — **Element:** 1960-10-16 — **Site:** 1960-10-16

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: SPENCE, W. #635 UC #M287459 (HERB)
Record Last Updated: 1995-10-20

Quad Summary: SAN MATEO (3712253/448D)
County Summary: SAN MATEO

Lat/Long: 37.51075° / -122.34456°
UTM: Zone-10 N4151735 E557926
Radius: 1/5 mile
Elevation: 400 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT
Township: 05S
Range: 04W
Section: 7 **Qtr:** XX
Meridian: M

Location: 0.2 MILE OFF SKYLINE BLVD ALONG RALSTON ROAD.

Location Detail: MAPPED ON PULGAS RIDGE NEAR HIGHWAY 280 ABOUT 0.5 MILE NORTH OF JUNCTION WITH HIGHWAY 92.

Ecological: ALONG ROADSIDE ON SERPENTINE OUTCROP.

General: ONLY SOURCE OF INFORMATION FOR THIS SITE IS 1960 COLLECTION BY SPENCE.

Owner/Manager: UNKNOWN

Lessingia arachnoidea

Crystal Springs lessingia

Element Code: PDAST5S0C0

Status

Federal: None
State: None

NDDB Element Ranks

Global: G1
State: S1.2

Other Lists

CNPS List: 1B
R-E-D Code: 3-2-3

Habitat Associations

General: COASTAL SAGE SCRUB, VALLEY AND FOOTHILL GRASSLAND, CISMONTANE WOODLAND.
Micro: GRASSY SLOPES ON SERPENTINE; SOMETIMES ON ROADSIDES. 60-200M.

Occurrence No. 5 **Map Index:** 26562 **EO Index:** 1674
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: ROSE, L. #41434 UC #829024 (HERB)

Dates Last Seen
Element: 1941-09-06
Site: 1941-09-06
Record Last Updated: 1995-10-20

Quad Summary: SAN MATEO (3712253/448D)
County Summary: SAN MATEO

Lat/Long: 37.53290° / -122.35166°
UTM: Zone-10 N4154189 E557281
Area: 91.9 ac
Elevation: 300 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POLYGON
Township: 04S
Range: 05W
Section: 6 **Qtr:** XX
Meridian: M

Location: SAN MATEO CANYON.
Location Detail: MAPPED ALONG SAN MATEO CREEK IN VICINITY OF LOWER CRYSTAL SPRINGS RESERVOIR. COLLECTION MADE AT 300' ELEVATION.
Ecological: OPEN GRASSY SLOPES.
General: ONLY SOURCE OF INFORMATION FOR THIS SITE IS 1941 COLLECTION BY ROSE.
Owner/Manager: UNKNOWN

Occurrence No. 6 **Map Index:** 28655 **EO Index:** 1708
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: HOWELL #2220 CAS #166074 *HERB)

Dates Last Seen
Element: 1926-10-09
Site: 1926-10-09
Record Last Updated: 1998-12-08

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

Lat/Long: 37.56839° / -122.40038°
UTM: Zone-10 N4158097 E552952
Radius: 1 mile
Elevation: 400 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT
Township: 04S
Range: 05W
Section: 22 **Qtr:** XX
Meridian: M

Location: HILLSIDE BETWEEN LAKE SAN ANDREAS AND CRYSTAL SPRINGS LAKE.
Location Detail: MAPPED WEST OF BURLINGAME.
General: ONLY SOURCE OF INFORMATION FOR THIS SITE IS 1926 COLLECTION BY HOWELL.
Owner/Manager: UNKNOWN

Occurrence No. 7 **Map Index:** 09172 **EO Index:** 1262
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: SMITH, S. 1994 (PERS)

Dates Last Seen
Element: 1994-08-26
Site: 1994-08-26
Record Last Updated: 1995-10-20

Quad Summary: WOODSIDE (3712243/429A)
County Summary: SAN MATEO

Lat/Long: 37.46232° / -122.28400°
UTM: Zone-10 N4146401 E563319
Radius: 1 mile
Elevation: 600 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT
Township: 05S
Range: 04W
Section: 27 **Qtr:** XX
Meridian: M

Location: EDGEWOOD PARK.
Location Detail: PARK IS WEST OF SAN CARLOS AND REDWOOD CITY SOUTHEAST OF THE JUNCTION OF EDGEWOOD ROAD AND HIGHWAY 280.
General: 1 PLANT OBSERVED IN 1994. ONLY SOURCE OF INFORMATION FOR THIS SITE IS SITE NAME AND CENSUS PROVIDED BY SMITH.
Owner/Manager: SMT COUNTY

Lichnanthe ursina

bumblebee scarab beetle

Element Code: IICOL67020

Status

Federal: None
State: None

NDDB Element Ranks

Global: G2
State: S2

Other Lists

CDFG Status:

Habitat Associations

General: INHABITS COASTAL SAND DUNES FROM SONOMA COUNTY SOUTH TO SAN MATEO COUNTY.
Micro: USUALLY FLIES CLOSE TO SAND SURFACE NEAR THE CREST OF THE DUNES.

Occurrence No. 4 **Map Index:** 08569 **EO Index:** 29053
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: CARLSON, D. 1980 (LIT)

Dates Last Seen

Element: XXXX-XX-XX
Site: XXXX-XX-XX

Record Last Updated: 1996-01-02

Quad Summary: MONTARA MOUNTAIN (3712254/448C), SAN FRANCISCO SOUTH (3712264/448B)
County Summary: SAN MATEO

Lat/Long: 37.62659° / -122.49553°
UTM: Zone-10 N4164505 E544515
Radius: 1 mile
Elevation: 15 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT
Township: 03S
Range: 06W
Section: XX **Qtr:** XX
Meridian: M

Location: LAGUNA SALADA, JUST W OF PACIFICA.
Location Detail:COLLECTED FROM THE DUNES AT SALADA BEACH.
Ecological: SPECIMENS COLLECTED FROM SAND DUNES, FROM APRIL TO AUGUST, WITH A PEAK IN MAY/JUNE.
Threat: A PORTION OF THE HABITAT IS A GOLF COURSE.
General: COLLECTION DATE UNKNOWN.
Owner/Manager: DPR

Malacothamnus aboriginum

Indian Valley bush mallow

Element Code: PDMAL0Q020

Status		**NDDB Element Ranks**		**Other Lists**	
Federal:	None	**Global:**	G3	**CNPS List:**	1B
State:	None	**State:**	S3.2	**R-E-D Code:**	2-2-3

Habitat Associations

General: CISMONTANE WOODLAND, CHAPARRAL.

Micro: GRANITIC OUTCROPS AND SANDY BARE SOIL, OFTEN IN DISTURBED SOILS. 150-1700M.

Occurrence No. 26 **Map Index:** 45128 **EO Index:** 63278

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: CONGDON, J. SN UC #138331 (HERB)

Dates Last Seen
Element: 1879-07-20
Site: 1879-07-20

Record Last Updated: 2005-11-18

Quad Summary: MONTARA MOUNTAIN (3712254/448C)

County Summary: SAN MATEO

Lat/Long: 37.56192° / -122.43556°
UTM: Zone-10 N4157360 E549849
Radius: 1 mile
Elevation: 1,150 ft

Mapping Precision NON-SPECIFIC
Symbol Type: POINT

Township: 04S
Range: 05W
Section: 29 **Qtr:** XX
Meridian: M

Location: SPRING VALLEY.

Location Detail: EXACT LOCATION UNKNOWN. MAPPED BY CNDDB AS BEST GUESS.

General: HERBARIUM LABEL GIVES COUNTY AS MARIPOSA, BUT THAT IS ASSUMED TO BE AN ERROR. CONGDON COLLECTED M. HALLII & M. DAVIDSONII IN SPRING VALLEY IN SAN MATEO COUNTY IN 1901 & 1902. MARIPOSA COUNTY IS OUT OF RANGE FOR THIS TAXON.

Owner/Manager: UNKNOWN

Malacothamnus arcuatus

arcuate bush mallow

Element Code: PDMAL0Q0E0

Status
Federal: None
State: None

NDDB Element Ranks
Global: G2Q
State: S2.2

Other Lists
CNPS List: 1B
R-E-D Code: 2-2-3

Habitat Associations
General: CHAPARRAL.
Micro: GRAVELLY ALLUVIUM. 80-355M.

Occurrence No. 16 **Map Index:** 55906 **EO Index:** 55922
Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: CORELLI, T. ET AL 2004 (OBS)

Dates Last Seen
Element: 2004-05-12
Site: 2004-05-12
Record Last Updated: 2004-06-25

Quad Summary: WOODSIDE (3712243/429A)
County Summary: SAN MATEO

Lat/Long: 37.49348° / -122.28130°
UTM: Zone-10 N4149860 E563531
Radius: 1/5 mile
Elevation: 400 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT
Township: 05S
Range: 04W
Section: 15 **Qtr:** SE
Meridian: M

Location: S OF PULGAS CREEK, N OF BIG CANYON PARK, W OF SAN CARLOS.

Location Detail: MAPPED ACCORDING TO UTM COORDINATES PROVIDED BY CORELLI ET AL.

Ecological: CHAPARRAL (DOMINANTS BACCHARIS PILULARIS AND CEANOTHUS CUNEATUS). WITH MIMULUS AURANTIACUS, TOXICODENDRON DIVERSILOBUM, LOTUS SCOPARIUS, HETEROMELES ARBUTIFOLIA, ARTEMISIA CALIFORNICA, CHLOROGALUM POMERIDIANUM, ERIOPHYLLUM CONFERTIFLORUM.

Threat: SOME EROSION. ENCROACHMENT OF GENISTA MONSPESSULANA IN THE AREA. DEVELOPMENT THREATENS.

General: 10 PLANTS SEEN IN 2004. AREA RECENTLY INCORPORATED IN THE CITY OF SAN CARLOS. NEGATIVE DECLARATION SUBMITTED FOR HOUSING DEVELOPMENT THAT WILL AFFECT THIS POPULATION. M. ARCUATUS NOT MENTIONED IN BIOLOGICAL ASSESSMENT.

Owner/Manager: CITY OF SAN CARLOS

Occurrence No. 17 **Map Index:** 55907 **EO Index:** 55923
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: THOMAS REID ASSOCIATES 1993 (LIT)

Dates Last Seen
Element: XXXX-XX-XX
Site: XXXX-XX-XX
Record Last Updated: 2004-06-25

Quad Summary: WOODSIDE (3712243/429A)
County Summary: SAN MATEO

Lat/Long: 37.47094° / -122.28464°
UTM: Zone-10 N4147357 E563255
Area: 3.8 ac
Elevation: 400 ft
Mapping PrecisionSPECIFIC
Symbol Type:POLYGON
Township: 05S
Range: 04W
Section: 27 **Qtr:** NW
Meridian: M

Location: N SIDE OF EDGEWOOD COUNTY PARK.

Location Detail: ONE COLONY MAPPED AS ONE POLYGON APPROX. 0.4 MILE E OF HWY 280, AND 0.1 MILE S OF EDGEWOOD ROAD.

Ecological: IN CHAPARRAL.

General: SITE LOCATION FROM 1993 "EDGEWOOD COUNTY PARK GOLF COURSE SITE CONSTRAINTS ANALYSIS". PER CORELLI, 1996 CNPS 6TH EDITION COMMENTS, A SMALL POP "AT EDGEWOOD" BURNED 2 YEARS AGO AND PRODUCED HUNDREDS OF SEEDLINGS WHICH ARE BEING MONITORED.

Owner/Manager: SMT COUNTY

Malacothamnus arcuatus

arcuate bush mallow

Element Code: PDMAL0Q0E0

Status		NDDB Element Ranks		Other Lists	
Federal:	None	**Global:**	G2Q	**CNPS List:**	1B
State:	None	**State:**	S2.2	**R-E-D Code:**	2-2-3

Habitat Associations

General: CHAPARRAL.

Micro: GRAVELLY ALLUVIUM. 80-355M.

Occurrence No. 18 **Map Index:** 55913 **EO Index:** 55929

Dates Last Seen
Element: XXXX-XX-XX
Site: XXXX-XX-XX

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: THOMAS, J. 1961 (LIT)

Record Last Updated: 2004-06-25

Quad Summary: SAN MATEO (3712253/448D)

County Summary: SAN MATEO

Lat/Long: 37.54178° / -122.34413°
UTM: Zone-10 N4155179 E557939
Radius: 3/5 mile
Elevation: 500 ft

Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT

Township: 04S
Range: 04W
Section: 31 **Qtr:** XX
Meridian: M

Location: BLACK MOUNTAIN.

Location Detail: EXACT LOCATION UNKNOWN. MAPPED AS BEST GUESS BY CNDDB, IN THE VICINITY OF BLACK MOUNTAIN, 0.2 MILE NW OF CRYSTAL SPRINGS ROAD, AND 0.7 MILES SSE OF HILLSBOROUGH PARK, SW OF SAN MATEO.

General: SITE PRESUMED TO BE "BLACK MOUNTAIN" IN SAN MATEO COUNTY DUE TO ELEVATION. (BLACK MOUNTAIN IN SANTA CLARA COUNTY IS APPROX. 2800' ELEVATION). ONLY INFORMATION IS 1961 FLORA OF THE SANTA CRUZ MOUNTAINS OF CA. NEEDS FIELDWORK.

Owner/Manager: UNKNOWN

Occurrence No. 20 **Map Index:** 55919 **EO Index:** 55935

Dates Last Seen
Element: XXXX-XX-XX
Site: 2000-07-15

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: ROBERTSON ET AL 2000 (OBS)

Record Last Updated: 2004-06-25

Quad Summary: MONTARA MOUNTAIN (3712254/448C), SAN FRANCISCO SOUTH (3712264/448B)

County Summary: SAN MATEO

Lat/Long: 37.61920° / -122.45859°
UTM: Zone-10 N4163704 E547778
Area: 55.9 ac
Elevation: 700 ft

Mapping PrecisionSPECIFIC
Symbol Type:POLYGON

Township: 04S
Range: 05W
Section: 06 **Qtr:** N
Meridian: M

Location: NW OF SAN ANDREAS LAKE, W OF SKYLINE BLVD., NEAR THE SAN FRANCISCO JAIL SITE.

Location Detail: FOUR COLONIES MAPPED IN THE VICINITY OF THE SAN FRANCISCO JAIL SITE, W OF THE W BOUNDARY OF THE CITY OF SAN BRUNO.

Ecological: PLANTS KNOWN TO OCCUR IN COASTAL SCRUB WITH BACCHARIS PILULARIS AND ARTEMISIA CALIFORNICA (GENERALLY S-FACING SLOPES). MAY BE FIRE DEPENDENT FOR SEED GERMINATION. OTHER RARE PLANT AT THIS SITE: DIRCA OCCIDENTALIS.

Threat: AREA WHERE PLANT COULD OCCUR (SUITABLE HABITAT) IS BULLDOZED FOR FIREBREAKS. MOWING. EXOTIC WEED INVASION.

General: NO PLANTS FOUND DURING 2000 SEARCH OF SITE. T. CORELLI, CNPS, HAD PREVIOUSLY SEEN M. ARCUATUS IN THIS AREA BUT COULD NOT RELOCATE PLANTS. UNKNOWN DATE OF PREVIOUS SITE VISIT. NEEDS FIELDWORK.

Owner/Manager: NPS-GGNRA, SFPUC

Malacothamnus arcuatus

arcuate bush mallow

Element Code: PDMAL0Q0E0

Status		NDDB Element Ranks		Other Lists	
Federal:	None	**Global:**	G2Q	**CNPS List:**	1B
State:	None	**State:**	S2.2	**R-E-D Code:**	2-2-3

Habitat Associations

General: CHAPARRAL.

Micro: GRAVELLY ALLUVIUM. 80-355M.

Occurrence No. 22 **Map Index:** 55921 **EO Index:** 55937

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: WRIGHT, D. 1986 (OBS)

Dates Last Seen
Element: 1986-07-09
Site: 1986-07-09

Record Last Updated: 2004-06-29

Quad Summary: MONTARA MOUNTAIN (3712254/448C)

County Summary: SAN MATEO

Lat/Long: 37.54591° / -122.40109°
UTM: Zone-10 N4155603 E552904
Area: 1.1 ac
Elevation: 705 ft

Mapping PrecisionSPECIFIC
Symbol Type:POLYGON

Township: 04S
Range: 05W
Section: 34 **Qtr:** NW
Meridian: M

Location: SAN MATEO CREEK CANYON AT THE S END OF SAWYER RIDGE.

Location Detail: ONE COLONY MAPPED AS ONE POLYGON IN SAN MATEO CREEK CANYON, APPROX. 1.2 MILES W OF PILARCITOS LAKE, AND 0.9 MILE E OF LOWER CRYSTAL SPRINGS RESERVOIR, NEAR THE S END OF SAWYER RIDGE.

Ecological: PLANTS LOCATED AT EDGE OF ROAD AND ARE COVERED WITH DUST AND MUD, BUT HAVE MANAGED TO PRODUCE A FEW FLOWERS.

Threat: TRAFFIC ON ROAD CAUSES DUST AND MUD TO BE THROWN ONTO PLANTS ALONG ROADWAY.

General: THREE PLANTS SEEN IN 1986. GRAVELLING ROAD MAY REDUCE DUST AND MUD IMPACTS ON PLANTS.

Owner/Manager: SAN FRANCISCO PUC

Malacothamnus davidsonii

Davidson's bush mallow

Element Code: PDMAL0Q040

Status		NDDB Element Ranks		Other Lists	
Federal:	None	**Global:**	G1	**CNPS List:**	1B
State:	None	**State:**	S1.1	**R-E-D Code:**	2-2-3

Habitat Associations

General: COASTAL SCRUB, RIPARIAN WOODLAND, CHAPARRAL.

Micro: SANDY WASHES. 180-855M.

Occurrence No. 39 **Map Index:** 61004 **EO Index:** 64315

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: CONGDON, J. SN UC #138326 (HERB)

Dates Last Seen
Element: 1897-07-27
Site: 1897-07-27

Record Last Updated: 2006-03-14

Quad Summary: SAN MATEO (3712253/448D)

County Summary: SAN MATEO

Lat/Long: 37.52022° / -122.27579°
UTM: Zone-10 N4152830 E563995
Radius: 1 mile
Elevation: 42 ft

Mapping Precision NON-SPECIFIC
Symbol Type: POINT

Township: 05S
Range: 04W
Section: 02 **Qtr:** XX
Meridian: M

Location: BELMONT.

Location Detail: EXACT LOCATION UNKNOWN.

General: 1897 CONGDON COLLECTION IS THE ONLY SOURCE FOR THIS SITE. NEEDS FIELDWORK.

Owner/Manager: UNKNOWN

Occurrence No. 40 **Map Index:** 45128 **EO Index:** 64316

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: CONGDON, J. SN UC #1041013 (HERB)

Dates Last Seen
Element: 1901-07-13
Site: 1901-07-13

Record Last Updated: 2006-03-14

Quad Summary: MONTARA MOUNTAIN (3712254/448C)

County Summary: SAN MATEO

Lat/Long: 37.56192° / -122.43556°
UTM: Zone-10 N4157360 E549849
Radius: 1 mile
Elevation: 1,150 ft

Mapping Precision NON-SPECIFIC
Symbol Type: POINT

Township: 04S
Range: 05W
Section: 29 **Qtr:** XX
Meridian: M

Location: SPRING VALLEY.

Location Detail: EXACT LOCATION UNKNOWN. MAPPED BY CNDDB AS BEST GUESS.

General: 1901 CONGDON COLLECTION IS THE ONLY SOURCE FOR THIS SITE. NEEDS FIELDWORK.

Owner/Manager: UNKNOWN

Malacothamnus hallii

Hall's bush mallow

Element Code: PDMAL0Q0F0

Status		NDDB Element Ranks		Other Lists	
Federal:	None	**Global:**	G1Q	**CNPS List:**	1B
State:	None	**State:**	S1.2	**R-E-D Code:**	3-2-3

Habitat Associations

General: CHAPARRAL.

Micro: SOME POPULATIONS ON SERPENTINE. 10-550M.

Occurrence No. 23 **Map Index:** 55914 **EO Index:** 63282

Dates Last Seen
Element: 1891-10-27
Site: 1891-10-27

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: EASTWOOD, A. SN UC #109094 (HERB)

Record Last Updated: 2005-11-21

Quad Summary: WOODSIDE (3712243/429A), SAN MATEO (3712253/448D)
County Summary: SAN MATEO

Lat/Long: 37.51310° / -122.31881°
UTM: Zone-10 N4152012 E560199
Radius: 1 mile
Elevation:
Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT
Township: 05S
Range: 04W
Section: 08 **Qtr:** XX
Meridian: M

Location: HILLS BACK OF BELMONT.
Location Detail:EXACT LOCATION UNKNOWN. MAPPED BY CNDDB AS BEST GUESS.
General: ONLY SOURCE OF INFORMATION FOR THIS OCCURRENCE IS AN 1891 COLLECTION BY EASTWOOD. NEEDS FIELDWORK.
Owner/Manager: UNKNOWN

Occurrence No. 24 **Map Index:** 45128 **EO Index:** 63283

Dates Last Seen
Element: 1902-07-20
Site: 1902-07-20

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: CONGDON, J. SN JEPS #26401 (HERB)

Record Last Updated: 2005-11-21

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

Lat/Long: 37.56192° / -122.43556°
UTM: Zone-10 N4157360 E549849
Radius: 1 mile
Elevation: 1,150 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT
Township: 04S
Range: 05W
Section: 29 **Qtr:** XX
Meridian: M

Location: SPRING VALLEY, VICINITY OF SAN FRANCISCO BAY.
Location Detail:EXACT LOCATION UNKNOWN. MAPPED BY CNDDB AS BEST GUESS.
General: ONLY SOURCE OF INFORMATION FOR THIS OCCURRENCE IS A 1902 COLLECTION BY CONGDON. NEEDS FIELDWORK.
Owner/Manager: UNKNOWN

Melospiza melodia pusillula

Alameda song sparrow

Element Code: ABPBXA301S

Status

Federal: None
State: None

NDDB Element Ranks

Global: G5T2?
State: S2?

Other Lists

CDFG Status: SC

Habitat Associations

General: RESIDENT OF SALT MARSHES BORDERING SOUTH ARM OF SAN FRANCISCO BAY.
Micro: INHABITS SALICORNIA MARSHES; NESTS LOW IN GRINDELIA BUSHES (HIGH ENOUGH TO ESCAPE HIGH TIDES) AND IN SALICORNIA.

Occurrence No. 27 **Map Index:** 43750 **EO Index:** 60983
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: MUSEUM OF VERTEBRATE ZOOLOGY 2005 (MUS)

Dates Last Seen
Element: 1898-11-05
Site: 1898-11-05
Record Last Updated: 2005-04-13

Quad Summary: SAN MATEO (3712253/448D)
County Summary: SAN MATEO

Lat/Long: 37.56330° / -122.32206°
UTM: Zone-10 N4157580 E559872
Radius: 1 mile
Elevation: 22 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT
Township: 04S
Range: 04W
Section: 20 **Qtr:** XX
Meridian: M

Location: SAN MATEO.

Location Detail:LOCATION GIVEN AS "SAN MATEO". MAX ERROR DISTANCE: 3 MILES. LOCATION MAPPED IN GENERAL AREA NW THE INTERSECTION OF HWY 92 AND HWY 101.

General: 1 MALE COLLECTED (MVZ# 6069) ON 14 MAR 1891. 5 COLLECTED (CAS #51610, 51627-8, 51640, 51648), NOV 1898. THERE IS SOME QUESTION REGARDING SUBSPECIES ID OF MVZ# 6069. SPECIMEN MAPPED AS PUSILLULA DUE TO LOCATION WHERE IT WAS FOUND.

Owner/Manager: UNKNOWN

Occurrence No. 32 **Map Index:** 08901 **EO Index:** 60993
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: MUSEUM OF VERTEBRATE ZOOLOGY 2005 (MUS)

Dates Last Seen
Element: 1947-10-05
Site: 1947-10-05
Record Last Updated: 2005-04-13

Quad Summary: MONTARA MOUNTAIN (3712254/448C), SAN FRANCISCO SOUTH (3712264/448B)
County Summary: SAN MATEO

Lat/Long:
UTM:
Radius:
Elevation:
Mapping Precision:
Symbol Type:
Township:
Range:
Section: **Qtr:**
Meridian:

Location: 1.75 MI WSW POINT SAN BRUNO, SAN BRUNO.

Location Detail:LOCATION GIVEN AS "1.75 MI WSW POINT SAN BRUNO" (MVZ), AND "SAN BRUNO" (CAS). LOCATION MAPPED TO INCLUDE LAT/LONG PROVIDED BY MVZ; MAX ERROR DISTANCE 0.25 MILE.

General: 2 COLLECTED (CAS# 40556, 40557) DURING DEC 1901. 5 COLLECTED (MVZ# 97444-97448) ON 5 OCT 1947.

Owner/Manager: UNKNOWN

Occurrence No. 37 **Map Index:** 61004 **EO Index:** 61040
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: CALIFORNIA ACADEMY OF SCIENCE 2005 (MUS)

Dates Last Seen
Element: 1924-10-26
Site: 1924-10-26
Record Last Updated: 2005-04-18

Quad Summary: SAN MATEO (3712253/448D)
County Summary: SAN MATEO

Lat/Long: 37.52022° / -122.27579°
UTM: Zone-10 N4152830 E563995
Radius: 1 mile
Elevation: 42 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT
Township: 05S
Range: 04W
Section: 02 **Qtr:** XX
Meridian: M

Location: BELMONT.

Location Detail:LOCATION STATED AS "BELMONT" AND MAPPED AT BELMONT.

General: 8 COLLECTED (CAS #27106 - 21110 & 51642 - 51644) DURING 1917 AND 1924.

Owner/Manager: UNKNOWN

Microcina edgewoodensis

Edgewood Park micro-blind harvestman

Element Code: ILARA47010

Status		NDDB Element Ranks		Other Lists	
Federal:	None	**Global:**	G1	**CDFG Status:**	
State:	None	**State:**	S1		

Habitat Associations

General: OPEN GRASSLAND IN XERIC ENVIRONMENTS.

Micro: FOUND BENEATH SERPENTINE ROCKS IN GRASSLAND ADJACENT TO SCRUB OAKS.

Occurrence No. 1
Map Index: 09172
EO Index: 58437
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: BRIGGS, T.S. AND D. UBICK 1989 (LIT)

Dates Last Seen
Element: 1987-01-02
Site: 1987-01-02

Record Last Updated: 2004-12-08

Quad Summary: WOODSIDE (3712243/429A)

County Summary: SAN MATEO

Lat/Long: 37.46232° / -122.28400°
UTM: Zone-10 N4146401 E563319
Radius: 1 mile
Elevation: 600 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT
Township: 05S
Range: 04W
Section: 27 **Qtr:** XX
Meridian: M

Location: EDGEWOOD PARK. NORTHWEST OF REDWOOD CITY.

Location Detail: HOLOTYPE COLLECTED IN VICINITY OF CANADA AND EDGEWOOD ROADS. PARATYPES COLLECTED FROM CANYON BETWEEN SYLVAN AND SERPENTINE TRAILS.

General: HOLOTYPE MALE COLLECTED 13 APR 1985, DEPOSITED AT CAS, AND 2 MALE PARATYPES, 2 JAN 1987, DEPOSTED AT CAS.

Owner/Manager: SMT COUNTY

Neotoma fuscipes annectens

San Francisco dusky-footed woodrat

Element Code: AMAFF08082

Status

Federal: None
State: None

NDDB Element Ranks

Global: G5T2T3
State: S2S3

Other Lists

CDFG Status: SC

Habitat Associations

General: FOREST HABITATS OF MODERATE CANOPY & MODERATE TO DENSE UNDERSTORY. MAY PREFER CHAPARRAL & REDWOOD HABITATS.

Micro: CONSTRUCTS NESTS OF SHREDDED GRASS, LEAVES & OTHER MATERIAL. MAY BE LIMITED BY AVAILABILITY OF NEST-BUILDING MATERIALS.

Occurrence No. 1
Map Index: 49615
EO Index: 49615
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: BURTON,K. 2001 (OBS)

Dates Last Seen

Element: 2001-08-21
Site: 2001-08-21

Record Last Updated: 2002-12-12

Quad Summary: WOODSIDE (3712243/429A)

County Summary: SAN MATEO

Lat/Long: 37.49704° / -122.32495°
UTM: Zone-10 N4150227 E559670
Radius: 80 meters
Elevation: 460 ft
Mapping PrecisionSPECIFIC
Symbol Type:POINT
Township: 05S
Range: 04W
Section: 17
Qtr:
Meridian: M

Location: EAST OF UPPER CRYSTAL SPRINGS RESERVOIR; APPROX 1.5 MILES WEST OF SAN CARLOS. NEXT TO HIGH VOLTAGE TRANSMISSION LINES.

Location Detail: TWO NESTS NEXT TO POWER LINE TRANSMISSION TOWER

Ecological: COASTAL OAK WOODLAND ADJACENT TO COASTAL SCRUB AND PERENNIAL GRASSLAND. MODERATE WEST-FACING SLOPE. SITE IS IN WATERSHED LAND NOT OPEN TO THE PUBLIC.

Threat: TOWER REPLACEMENT LIKELY IN THE NEAR FUTURE. NESTS NEXT TO TRANSMISSION TOWER

General: ONE ANIMAL OBSERVED AND NOTED AS NESTING; TWO NESTS INCLUDING ONE LARGE TREE NEST AND ONE SMALL GROUND NEST, ON SITE.

Owner/Manager: SFO CITY/COUNTY

Northern Coastal Salt Marsh

Element Code: CTT52110CA

Status
Federal: None
State: None

NDDB Element Ranks
Global: G3
State: S3.2

Other Lists

Habitat Associations
General:
Micro:

Occurrence No. 13 **Map Index:** 09280 **EO Index:** 30343

Dates Last Seen
Element: 1977-06-XX
Site: 1985-11-XX

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Record Last Updated: 1998-07-20
Main Source: JONES & STOKES ASSOC. 1979 (LIT)

Quad Summary: REDWOOD POINT (3712252/447C), SAN MATEO (3712253/448D)
County Summary: SAN MATEO

Lat/Long: 37.54174° / -122.25080°
UTM: Zone-10 N4155235 E566185
Area: 514.5 ac
Elevation: 15 ft
Mapping Precision SPECIFIC
Symbol Type: POLYGON
Township: 04S
Range: 03W
Section: 36 **Qtr:** XX
Meridian: M

Location: BELMONT SLOUGH, SW SAN FRANCISCO BAY.
Location Detail: ON BIRD ISLAND AND ALONG THE FRINGES OF THE SHORE.
Ecological: 30% OF COVER IS SALICORNIA VIRGINICA, 20% IS DISTICHLIS SPICATA, 10% IS JAUMEA CARNOSA.
Threat: NEXT TO SALT PONDS, INDUSTRY, HOUSE DEVELOPMENT.
General: WITHIN CDFG ECOLOGICAL RESERVE. THIS WAS OCC #013 OF CTT52110CA.
Owner/Manager: DFG

Occurrence No. 14 **Map Index:** 09153 **EO Index:** 16155

Dates Last Seen
Element: 1977-06-XX
Site: 1977-06-XX

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Record Last Updated: 1998-07-20
Main Source: JONES & STOKES ASSOC. 1979 (LIT)

Quad Summary: SAN MATEO (3712253/448D)
County Summary: SAN MATEO

Lat/Long: 37.57322° / -122.28945°
UTM: Zone-10 N4158701 E562744
Area: 76.9 ac
Elevation:
Mapping Precision SPECIFIC
Symbol Type: POLYGON
Township: 04S
Range: 04W
Section: 22 **Qtr:** XX
Meridian: M

Location: MOUTH SEAL SLOUGH ON BREWER ISLAND, SW SAN FRANCISCO BAY.
Ecological: UNABLE TO CONVERT TO FLORISTIC CLASSIFICATION, LACKS SPP. INFO.
Threat: NEXT TO HOUSING DEVELOPMENTS.
Owner/Manager: UNKNOWN

Occurrence No. 25 **Map Index:** 08553 **EO Index:** 26269

Dates Last Seen
Element: 1978-03-21
Site: 1978-03-21

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Record Last Updated: 1998-07-20
Main Source: DANA, G. 1978 (OBS)

Quad Summary: HALF MOON BAY (3712244/429B), MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

Lat/Long: 37.50188° / -122.49526°
UTM: Zone-10 N4150669 E544612
Radius: 1/5 mile
Elevation:
Mapping Precision NON-SPECIFIC
Symbol Type: POINT
Township: 05S
Range: 06W
Section: 11 **Qtr:** XX
Meridian: M

Location: E OF PILLAR PT NEXT TO PRINCETON
Location Detail: MAP DETAIL AT CNDDB.
Ecological: ABOUT 4 HA SALT MARSH DOM BY SALICORNIA, JAMUEA CARNOSA, FRANKENIA GRANDIFOLIA; ASSOC W/BRACKISH & FRESHWATER MARSH.
Threat: DEGRADED BY PAST RD CONST. & MORE RECENT SEWAGE SPILLS.
General: THIS WAS OCC #025 OF CTT52110CA.
Owner/Manager: PVT

Northern Maritime Chaparral

Element Code: CTT37C10CA

Status
Federal: None
State: None

NDDB Element Ranks
Global: G1
State: S1.2

Other Lists

Habitat Associations
General:
Micro:

Occurrence No. 11 **Map Index:** 08631 **EO Index:** 16312
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: HOOD, L. 1977 (LIT)

Dates Last Seen
Element: 1978-03-XX
Site: 1978-03-XX
Record Last Updated: 1998-07-14

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

Lat/Long: 37.57039° / -122.47993°
UTM: Zone-10 N4158277 E545926
Area: 536.1 ac
Elevation: 1,000 ft
Mapping PrecisionSPECIFIC
Symbol Type:POLYGON
Township: 04S
Range: 06W
Section: 23 **Qtr:** XX
Meridian: M

Location: SAN PEDRO VALLEY COUNTY PARK, SE OF PEDRO VALLEY (TOWN).

Ecological: STANDS INCL ENDEMIC ARCTOSTAPHYLOS MONTARAENSIS. UNABLE TO CONVERT TO FLORISTIC CLASSIFICATION, LACKS SPP. INFO.

Owner/Manager: UNKNOWN

Occurrence No. 16 **Map Index:** 20182 **EO Index:** 12757
Occ Rank: Excellent
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: CORRELLI, T. 1991 (OBS)

Dates Last Seen
Element: 1991-07-16
Site: 1991-07-16
Record Last Updated: 1998-07-14

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

Lat/Long: 37.55263° / -122.45226°
UTM: Zone-10 N4156321 E548380
Area: 308.4 ac
Elevation: 1,400 ft
Mapping PrecisionSPECIFIC
Symbol Type:POLYGON
Township: 04S
Range: 05W
Section: 30 **Qtr:** XX
Meridian: M

Location: WHITING RIDGE AND MONTARA MOUNTAIN IN THE PILARCITOS LAKE DRAINAGE. MANAGED BY SAN FRANCISCO WATER DEPARTMENT.

Location Detail:THREE AREAS OF CHAPARRAL ALONG A NE TRENDING RIDGE.

Ecological: PRISTINE CHAPARRAL WITH VIABLE POPULATIONS OF ARCTOSTAPHYLOS MONTARAENSIS AND LUPINUS ARBOREUS VAR. EXIMIUS. UNABLE TO CONVERT TO FLORISTIC CLASSIFICATION, LACKS SPP. INFO.

Owner/Manager: SFO CITY/COUNTY(MGMT BY SFPUC)

Nothochrysa californica

San Francisco lacewing

Element Code: IINEU12010

Status
Federal: None
State: None

NDDB Element Ranks
Global: GNR
State: S1S3

Other Lists
CDFG Status:

Habitat Associations
General:
Micro:

Occurrence No. 3 **Map Index:** 43750 **EO Index:** 60276
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: SHANKS, S. 2005 (MUS)

Dates Last Seen
Element: 1959-04-08
Site: 1959-04-08
Record Last Updated: 2005-02-25

Quad Summary: SAN MATEO (3712253/448D)
County Summary: SAN MATEO

Lat/Long: 37.56330° / -122.32206°
UTM: Zone-10 N4157580 E559872
Radius: 1 mile
Elevation: 22 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT
Township: 04S
Range: 04W
Section: 20 **Qtr:** XX
Meridian: M

Location: SAN MATEO.

General: HISTORICAL SPECIMEN, DEPOSITED IN UC-DAVIS BOHART MUSEUM OF ENTOMOLOGY.

Owner/Manager: UNKNOWN

Nyctinomops macrotis

big free -tailed bat

Element Code: AMACD04020

Status		NDDB Element Ranks		Other Lists	
Federal:	None	**Global:**	G5	**CDFG Status:**	SC
State:	None	**State:**	S2		

Habitat Associations

General: LOW-LYING ARID AREAS IN SOUTHERN CALIFORNIA.

Micro: NEED HIGH CLIFFS OR ROCKY OUTCROPS FOR ROOSTING SITES. FEEDS PRINCIPALLY ON LARGE MOTHS.

Occurrence No. 20 **Map Index:** 43751 **EO Index:** 59596

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: MANIS 2005 (MUS)

Dates Last Seen
Element: 1984-01-03
Site: 1984-01-03

Record Last Updated: 2005-01-24

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

Lat/Long:
UTM:
Radius:
Elevation:
Mapping Precision:
Symbol Type:
Township:
Range:
Section: **Qtr:**
Meridian:

Location: PACIFICA.

Location Detail: EXACT LOCATION UNKNOWN. LOCATION ONLY GIVEN AS PACIFICA. LAT/LONG COORDINATES PROVIDED BY MANIS FALL WITHIN THIS CIRCLE AND HAVE AN UNCERTAINITY OF 3218 METERS (~2 MILES).

General: ONE FEMALE SPECIMEN COLLECTED 3 JAN 1984 BY D. CONSTANTINE AT "PACIFICA." DEPOSITED AT MVZ #181993.

Owner/Manager: UNKNOWN

Oncorhynchus mykiss irideus

steelhead-central California coast esu

Element Code: AFCHA0209G

Status

Federal: Threatened
State: None

NDDB Element Ranks

Global: G5T2Q
State: S2

Other Lists

CDFG Status:

Habitat Associations

General: FROM RUSSIAN RIVER, SOUTH TO SOQUEL CR & TO, BUT NOT INCLUDING, PAJARO RIVER. ALSO SAN FRANCISCO & SAN PABLO BAY BASINS.
Micro:

Occurrence No. 3 **Map Index:** 41534 **EO Index:** 41534
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: SALAMUNOVICH, T. 1999 (OBS)

Dates Last Seen
Element: 1999-04-15
Site: 1999-04-15
Record Last Updated: 1999-08-30

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

Lat/Long: 37.51059° / -122.41578°
UTM: Zone-10 N4151676 E551632
Radius: 80 meters
Elevation: 550 ft
Mapping PrecisionSPECIFIC
Symbol Type:POINT
Township: 05S
Range: 05W
Section: 09 **Qtr:** XX
Meridian: M

Location: APANOLIO CREEK, TRIBUTARY TO PILARCITOS CREEK, 2.4 MILES SSE OF SCRAPER PEAK, ~3.5 MILE NNE HALF MOON BAY.

Location Detail: APANOLIO CREEK IN DIGGES CANYON, BROWNING-FERRIS INDUSTRIES PROPERTY.

Ecological: STREAM RUNS THROUGH COASTAL FOREST.

General: 1 STEELHEAD SMOLT CAPTURED AND RELEASED, 1999.

Owner/Manager: PVT

Occurrence No. 10 **Map Index:** 34077 **EO Index:** 30141
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: TITUS, R. & D. ERMAN 1994 (LIT)

Dates Last Seen
Element: 1979-09-20
Site: 1979-09-20
Record Last Updated: 1999-09-30

Quad Summary: HALF MOON BAY (3712244/429B), MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

Lat/Long: 37.49779° / -122.43590°
UTM: Zone-10 N4150245 E549862
Area: 218.8 ac
Elevation: 200 ft
Mapping PrecisionSPECIFIC
Symbol Type:POLYGON
Township: 05S
Range: 05W
Section: 17 **Qtr:** XX
Meridian: M

Location: FRENCHMANS CREEK, NORTH SIDE OF HALF MOON BAY, HALF MOON BAY STATE BEACH.

Location Detail: FROM MOUTH AT PACIFIC OCEAN TO LOCKS CREEK CONFLUENCE (APPROXIMATELY 8 KILOMETERS UPSTREAM FROM MOUTH).

Ecological: IN MID-1930'S NATURAL PROPAGATION RATED AS FAIR. IN 1958 SPAWNING AREAS WERE RATED POOR-TO-FAIR, BUT REARING HABITAT (POOLS, UNDERCUT BANKS, VEGETATIVE COVER) WERE ABUNDANT. IN 1979 CONDITIONS WERE MUCH THE SAME AS IN 1958.

Threat: COMPETITION FROM EXOTICS (BROWN TROUT), EROSION, WATER DIVERSIONS (5 ACTIVE ONES IDENTIFIED), DAMS.

General: 3 FLASHBOARD DAMS (0.9-2.4 M HIGH) NOTED AS POTENTIAL BARRIERS TO FISH MIGRATION IN 1979.

Owner/Manager: PVT, DPR-HALF MOON BAY SB

Occurrence No. 12 **Map Index:** 34079 **EO Index:** 30140
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: TITUS, R. & D. ERMAN 1994 (LIT)

Dates Last Seen
Element: 2002-XX-XX
Site: 2002-XX-XX
Record Last Updated: 2003-06-12

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

Lat/Long: 37.58080° / -122.48138°
UTM: Zone-10 N4159431 E545791
Area: 245.7 ac
Elevation: 100 ft
Mapping PrecisionSPECIFIC
Symbol Type:POLYGON
Township: 04S
Range: 06W
Section: 14 **Qtr:** XX
Meridian: M

Location: SAN PEDRO CREEK, SAN PEDRO COUNTY PARK, PACIFICA

Location Detail: FROM MOUTH AT PACIFIC OCEAN TO HEADWATERS, THE MIDDLE FORK HAS PERENNIAL FLOW. IN SOUTH FORK, STEELHEAD WERE FOUND UP TO THE WATER DISTRICT DIVERSION. NORTH FORK, UNCERTAIN BUT FISH HAVE BEEN FOUND IN THERE.

Ecological: IN 1941 THE STREAM WAS IN RELATIVELY GOOD CONDITION. BY 1971 STREAM SEVERLY DEGRADED. CONDTIONS HAVE IMPROVED SINCE THEN. IN 1988 REARING HABITAT WAS GOOD/EXCELLENT, RIPARIAN VEGETATION ABUNDANT & WATER FLOW WAS CONTINUOUS.

Threat: THREATENED BY POLLUTION FROM STORM DRAIN DISCHARGE, DIVERSIONS, AND URBANIZATION.

General: HIGHLY URBANIZED STREAM WHICH CONTINUES TO SUPPORT A NATURALLY REPRODUCING STEELHEAD POPULATION. HEADWATERS PROTECTED BY INCLUSION IN SAN PEDRO VALLEY COUNTY PARK. 180 STEELHEAD CAPTURED/RELEASED IN 2002; 1 FISH

Oncorhynchus mykiss irideus

steelhead-central California coast esu

Element Code: AFCHA0209G

Status		**NDDB Element Ranks**		**Other Lists**	
Federal:	Threatened	**Global:**	G5T2Q	**CDFG Status:**	
State:	None	**State:**	S2		

Habitat Associations

General: FROM RUSSIAN RIVER, SOUTH TO SOQUEL CR & TO, BUT NOT INCLUDING, PAJARO RIVER. ALSO SAN FRANCISCO & SAN PABLO BAY BASINS.

Micro:

COLLECTED/DEPOSITED AT CAS.

Owner/Manager: PVT, SMT COUNTY, CITY

Pentachaeta bellidiflora

white-rayed pentachaeta

Element Code: PDAST6X030

Status
Federal: Endangered
State: Endangered

NDDB Element Ranks
Global: G1
State: S1.1

Other Lists
CNPS List: 1B
R-E-D Code: 3-3-3

Habitat Associations
General: VALLEY AND FOOTHILL GRASSLAND.
Micro: OPEN DRY ROCKY SLOPES AND GRASSY AREAS, OFTEN ON SOILS DERIVED FROM SERPENTINE BEDROCK. 35-620M.

Occurrence No. 1 **Map Index:** 09122 **EO Index:** 27386
Occ Rank: Excellent
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Fluctuating
Main Source: CHANDIK, Z. 1991 (OBS)

Dates Last Seen
Element: 1997-04-XX
Site: 1997-04-XX
Record Last Updated: 1998-04-14

Quad Summary: WOODSIDE (3712243/429A)
County Summary: SAN MATEO

Lat/Long: 37.46349° / -122.29331°
UTM: Zone-10 N4146525 E562495
Area: 41.0 ac
Elevation: 520 ft
Mapping PrecisionSPECIFIC
Symbol Type:POLYGON
Township: 05S
Range: 04W
Section: 27 **Qtr:** XX
Meridian: M

Location: THE TRIANGLE: AREA BOUNDED BY I-280, EDGEWOOD DRIVE, AND CANADA DRIVE; ALSO FOUND EAST OF HWY, IN EDGEWOOD PARK.

Location Detail: SFO CITY/COUNTY PROPERTY MANAGED BY SAN FRANCISCO WATER DEPARTMENT.

Ecological: ROCKY BARE AREAS IN SERPENTINE WILDFLOWER FIELD. W/PLANTAGO ERECTA, NASSELLA PULCHRA, LAYIA PLATYGLOSSA, & BRODIAEA SPP. OTHER RARE PLANTS NEARBY: HESPEROLINON CONGESTUM, ACANTHOMINTHA DUTTONII, CIRSIUM FONTINALE, BAY CHECKERSPOT BUTTERFLY.

Threat: PROPOSED GOLF COURSE AT EDGEWOOD PARK, PAVED RECREATION TRAIL, COMPETITION W/NONNATIVE PLANTS, & VANDALISM THREATEN.

General: POPULATION GROWING SINCE 1978. ABOUT 1 MILLION PLANTS SEEN IN 1982, THOUSANDS IN 1987. MILLIONS SEEN IN '89, '91 & '92. PARK POPULATION IS SMALL (APPROX. 100 IN 1989, 950 IN 1992).

Owner/Manager: SFO CITY/COUNTY, SMT COUNTY

Occurrence No. 2 **Map Index:** 08828 **EO Index:** 16684
Occ Rank: None
Origin: Natural/Native occurrence
Presence: Extirpated
Trend: Unknown
Main Source: ROSE, L. #48032 RSA (HERB)

Dates Last Seen
Element: 1948-03-31
Site: 1991-04-30
Record Last Updated: 1996-01-11

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

Lat/Long: 37.59576° / -122.42053°
UTM: Zone-10 N4161123 E551153
Radius: 1 mile
Elevation: 500 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT
Township: 04S
Range: 05W
Section: 9 **Qtr:** XX
Meridian: M

Location: SKYLINE BLVD ABOVE SAN ANDREAS LAKE.

General: ACCORDING TO T. CORELLI, HABITAT IS GONE; THERE IS A ROAD THERE (1991). MANAGED BY SAN FRANCISCO WATER DEPARTMENT.

Owner/Manager: SFO CITY/COUNTY(MGMT BY SFPUC)

Phalacrocorax auritus

double-crested cormorant

Element Code: ABNFD01020

Status		**NDDB Element Ranks**		**Other Lists**	
Federal:	None	**Global:**	G5	**CDFG Status:**	SC
State:	None	**State:**	S3		

Habitat Associations

General: (ROOKERY SITE) COLONIAL NESTER ON COASTAL CLIFFS, OFFSHORE ISLANDS, & ALONG LAKE MARGINS IN THE INTERIOR OF THE STATE.

Micro: NESTS ALONG COAST ON SEQUESTERED ISLETS, USUALLY ON GROUND WITH SLOPING SURFACE, OR IN TALL TREES ALONG LAKE MARGINS.

Occurrence No. 27 **Map Index:** 25571 **EO Index:** 5671

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: CARTER, H. ET AL 1989 (LIT)

Dates Last Seen
Element: 1988-XX-XX
Site: 1988-XX-XX

Record Last Updated: 1996-02-15

Quad Summary: REDWOOD POINT (3712252/447C), SAN MATEO (3712253/448D)

County Summary: ALAMEDA, SAN MATEO

Lat/Long: 37.59507° / -122.22890°
UTM: Zone-10 N4161168 E568071
Area: 560.5 ac
Elevation: 30 ft

Mapping PrecisionNON-SPECIFIC
Symbol Type:POLYGON

Township: 04S
Range: 03W
Section: 0 **Qtr:** XX
Meridian: M

Location: HAYWARD-SAN MATEO BRIDGE, SOUTH SAN FRANCISCO BAY.

Location Detail:NESTS FOUND ON UTILITY TOWERS NEXT TO THE BRIDGE.

General: DATA REPORTED IN FEBRUARY 1989 REPORT BY POINT REYES BIRD OBSERVATORY.

Owner/Manager: CALTRANS

Plagiobothrys chorisianus var. chorisianus

Choris's popcorn-flower

Element Code: PDBOR0V061

Status		**NDDB Element Ranks**		**Other Lists**	
Federal:	None	**Global:**	G3T2Q	**CNPS List:**	1B
State:	None	**State:**	S2.2	**R-E-D Code:**	2-2-3

Habitat Associations

General: CHAPARRAL, COASTAL SCRUB, COASTAL PRAIRIE.

Micro: MESIC SITES. 15-100M.

Occurrence No. 7 **Map Index:** 57032 **EO Index:** 57048

Dates Last Seen
Element: 1972-04-16
Site: 1972-04-16

Record Last Updated: 2004-09-28

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: HECKARD, L. & J. THOMAS #2897 (HERB)

Quad Summary: WOODSIDE (3712243/429A)
County Summary: SAN MATEO

Lat/Long: 37.46598° / -122.31062°
UTM: Zone-10 N4146790 E560961
Area: 62.3 ac
Elevation: 400 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POLYGON
Township: 05S
Range: 04W
Section: 28 **Qtr:** SW
Meridian: M

Location: ALONG OLD CANADA ROAD, ABOUT 1.5 MILES S OF PULGAS WATER TEMPLE, SW OF UPPER CRYSTAL SPRINGS RESERVOIR.

Location Detail: EXACT LOCATION UNKNOWN. MAPPED AS BEST GUESS BY CNDDB, ALONG OLD CANADA ROAD, 1.5 MILE S OF PULGAS WATER TEMPLE, 0.6 MILE W OF THE INTERSECTION OF CANADA ROAD AND EDGEWOOD ROAD.

Ecological: MOIST SOIL OF MEADOW IN OAK-MADRONE AREA.

General: UNKNOWN NUMBER OF PLANTS SEEN IN 1972. NEEDS FIELDWORK.

Owner/Manager: UNKNOWN

Occurrence No. 9 **Map Index:** 57034 **EO Index:** 57050

Dates Last Seen
Element: 2002-05-20
Site: 2002-05-20

Record Last Updated: 2004-09-28

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: TAYLOR, J. 2002 (MAP)

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

Lat/Long: 37.61500° / -122.45943°
UTM: Zone-10 N4163237 E547707
Radius: 80 meters
Elevation: 1,250 ft
Mapping PrecisionSPECIFIC
Symbol Type:POINT
Township: 04S
Range: 05W
Section: 06 **Qtr:** NW
Meridian: M

Location: N END OF SWEENEY RIDGE, NW OF SAN ANDREAS LAKE, GOLDEN GATE NATIONAL RECREATION AREA.

Location Detail: ONE POLYGON MAPPED AT THE N END OF SWEENEY RIDGE, APPROX. 1.1 MILES W OF HWY 280 IN SAN BRUNO, AND 1.4 MILES E OF HWY 1. MAPPED IN NW1/4 OF NW1/4 SEC 6.

General: INFORMATION FOR THIS SITE OBTAINED FROM MAP SUBMITTED BY TAYLOR, AND SHAPEFILE DATA CORRESPONDING TO GOLDEN GATE NATIONAL RECREATION AREA FIELD SURVEY FORMS. 35 PLANTS SEEN IN 2002.

Owner/Manager: NPS-GGNRA

Occurrence No. 10 **Map Index:** 57035 **EO Index:** 57051

Dates Last Seen
Element: 1994-XX-XX
Site: 2002-06-24

Record Last Updated: 2004-09-28

Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: TAYLOR, J. 2002 (OBS)

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

Lat/Long: 37.59361° / -122.44596°
UTM: Zone-10 N4160871 E548910
Area: 5.6 ac
Elevation: 1,000 ft
Mapping PrecisionSPECIFIC
Symbol Type:POLYGON
Township: 04S
Range: 05W
Section: 07 **Qtr:** SE
Meridian: M

Location: SOUTH MEADOW, S END OF SWEENEY RIDGE, W OF SAN ANDREAS LAKE, GOLDEN GATE NATIONAL RECREATION AREA.

Location Detail: 2 COLONIES MAPPED AS 2 POLYGONS, NEAR THE SE END OF SWEENEY RIDGE, APPROX. 0.1 MILE SW OF PORTOLA ROAD.

Ecological: COMMUNITY INTERSPERSED WITH COASTAL GRASSLAND ALONG RIDGE TOP AND SLOPE DOWN TO WET MEADOW. WITH BACCHARIS PILULARIS, RUBUS URSINUS. UNDERSTORY FORBS INCLUDE SATUREJA DOUGLASII, GALIUM NUTTALLII, AND FRAGARIA VESCA.

Threat: COMPETITION FROM EXOTIC SPECIES. MEADOW IS INFESTED WITH HOLCUS LANATUS. ALSO, OVERGROWTH OF SHRUB SPECIES.

General: INFORMATION FOR THIS SITE OBTAINED FROM GGNRA SHAPEFILE DATA COPIED FROM 1994 DATA FILE. UNKNOWN NUMBER OF PLANTS SEEN IN 1994. NO PLANTS SEEN IN 2002.

Owner/Manager:

Plagiobothrys chorisianus var. chorisianus

Choris's popcorn-flower

Element Code: PDBOR0V061

Status		NDDB Element Ranks		Other Lists	
Federal:	None	**Global:**	G3T2Q	**CNPS List:**	1B
State:	None	**State:**	S2.2	**R-E-D Code:**	2-2-3

Habitat Associations

General: CHAPARRAL, COASTAL SCRUB, COASTAL PRAIRIE.

Micro: MESIC SITES. 15-100M.

NPS-GGNRA

Plebejus icarioides missionensis

Mission blue butterfly

Element Code: IILEPG801A

Status
Federal: Endangered
State: None

NDDB Element Ranks
Global: G5T1
State: S1

Other Lists
CDFG Status:

Habitat Associations
General: INHABITS GRASSLANDS OF THE SAN FRANCISCO PENINSULA.
Micro: THREE LARVAL HOST PLANTS: LUPINUS ALBIFRONS, L. VARIICOLOR, AND L. FORMOSUS, OF WHICH L. ALBIFRONS IS FAVORED.

Occurrence No. 7 **Map Index:** 08670 **EO Index:** 23000
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: LANGSTON, R. 1984 (OBS)

Dates Last Seen
Element: 1985-05-XX
Site: 1985-05-XX
Record Last Updated: 2000-01-24

Quad Summary: MONTARA MOUNTAIN (3712254/448C), SAN FRANCISCO SOUTH (3712264/448B)
County Summary: SAN MATEO

Lat/Long: 37.62631° / -122.46865°
UTM: Zone-10 N4164487 E546886
Area: 97.2 ac
Elevation: 700 ft
Mapping PrecisionSPECIFIC
Symbol Type:POLYGON
Township: 03S
Range: 06W
Section: 36 **Qtr:** XX
Meridian: M

Location: SKYLINE COMMUNITY COLLEGE/SWEENEY RIDGE TO COAST GUARD RESERVATION, PACIFICA.

Location Detail:FOUND IN AREAS SHELTERED FROM WIND, ALTHOUGH MANY LUPINUS ALBIFRONS (PREFERRED FOOD SPECIES) WERE FOUND ON THE SITE.

Ecological: LUPINIUS ALBIFRONS (PREFERRED, L. VARIICOLOR; ASSOC VEGETATION: L. ARBOREUS, LOTUS CORNICULATUS, ERIOGONUM LATIFOLIOM, PLANTED MONTEREY PINES, INTRODUCED GRASSES & MUSTARD.

General: MANY SIGHTINGS IN 1985. 10 ADULTS OBSERVED 1984.

Owner/Manager: NPS-GGNRA, UNKNOWN, DOD

Occurrence No. 11 **Map Index:** 08842 **EO Index:** 22997
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: U.S. FISH & WILDLIFE SERVICE 1985 (LIT)

Dates Last Seen
Element: 1985-05-08
Site: 1985-05-08
Record Last Updated: 1999-06-07

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

Lat/Long: 37.57811° / -122.41003°
UTM: Zone-10 N4159170 E552093
Radius: 1/5 mile
Elevation: 500 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT
Township: 04S
Range: 05W
Section: 16 **Qtr:** XX
Meridian: M

Location: SAN ANDREAS DAM, ABOUT 2 MILES NW OF HILLSBOROUGH.

General: SOUTHERN LIMIT OF DISTRIBUTION.

Owner/Manager: SFO CITY/COUNTY

Potentilla hickmanii

Hickman's cinquefoil

Element Code: PDROS1B0U0

Status		NDDB Element Ranks		Other Lists	
Federal:	Endangered	**Global:**	G1	**CNPS List:**	1B
State:	Endangered	**State:**	S1.1	**R-E-D Code:**	3-3-3

Habitat Associations

General: COASTAL BLUFF SCRUB, CLOSED-CONE CONIFEROUS FOREST, MEADOWS AND SEEPS, MARSHES AND SWAMPS.

Micro: FRESHWATER MARSHES, SEEPS, AND SMALL STREAMS IN OPEN OR FORESTED AREAS ALONG THE COAST. 5-125M.

Occurrence No. 1 **Map Index:** 08497 **EO Index:** 19533

Occ Rank: None
Origin: Natural/Native occurrence
Presence: Extirpated
Trend: Unknown
Main Source: SUTLIFFE, E. SN CAS (HERB)

Dates Last Seen
Element: 1933-05-06
Site: 1933-05-06
Record Last Updated: 1999-01-19

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

Lat/Long: 37.52626° / -122.51227°
UTM: Zone-10 N4153366 E543095
Radius: 2/5 mile
Elevation: 25 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT
Township: 05S
Range: 06W
Section: 03 **Qtr:** XX
Meridian: M

Location: MOSS BEACH NEAR HALFMOON BAY. (MAPPED 0.7 MI S POINT MONTARA.)

Ecological: GROWING ON FLAT NEAR EDGE OF OCEAN BLUFF.

General: PLANTS BELIEVED EXTIRPATED DUE TO DEVELOPMENTAL PRESSURES AND EROSION.

Owner/Manager: UNKNOWN

Occurrence No. 6 **Map Index:** 40646 **EO Index:** 35653

Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: VONARB, R. 1996 (OBS)

Dates Last Seen
Element: 2002-02-XX
Site: 2002-02-XX
Record Last Updated: 2003-01-16

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

Lat/Long: 37.55081° / -122.50546°
UTM: Zone-10 N4156093 E543682
Area: 6.5 ac
Elevation: 200 ft
Mapping PrecisionSPECIFIC
Symbol Type:POLYGON
Township: 04S
Range: 06W
Section: 27 **Qtr:** SE
Meridian: M

Location: DEVILS SLIDE POPULATION; 0.3-0.35 MI E OF HWY 1, N OF TOWN OF MONTARA. 0.1-0.3 MI SE OF MARTINI CREEK.

Location Detail: 3 COLONIES. ONE ALONT USE TRAIL THAT LEADS TO THE BARRIER AND ROAD EXTENSION OF CEDAR ROAD IN MONTARA TO OCEAN VIEW FARMS. THIS ROAD IS A PUBLIC EASEMENT OFOR PEOPLE TO ACCESS MCNEE RANCH STATE PARK.

Ecological: NATIVE AND NONNATIVE GRASSLAND WITH STIPA SPP., POA SCABRELLA, DANTHONIA CA., AIRA CARYOPHYLLA, BRIZA MINOR, PLANTAGO LANCEOLATA, & LUPINUS SPP.

Threat: NON-NATIVE ENCROACHMENT. TRAMPLING.

General: TOTAL OF 2600 PLANTS HERE AND AT OCCURRENCE #7 IN 1995; 1990 PLANTS IN BOTH OCCS IN 1996. 104 PLANTS OBSERVED IN 2000 AT THREE LOCATIONS. UNKNOWN NUMBER OF PLANTS OBSERVED IN 2002 BY MOROSCO

Owner/Manager: PVT

Potentilla hickmanii

Hickman's cinquefoil

Element Code: PDROS1B0U0

Status		NDDB Element Ranks		Other Lists	
Federal:	Endangered	**Global:**	G1	**CNPS List:**	1B
State:	Endangered	**State:**	S1.1	**R-E-D Code:**	3-3-3

Habitat Associations

General: COASTAL BLUFF SCRUB, CLOSED-CONE CONIFEROUS FOREST, MEADOWS AND SEEPS, MARSHES AND SWAMPS.

Micro: FRESHWATER MARSHES, SEEPS, AND SMALL STREAMS IN OPEN OR FORESTED AREAS ALONG THE COAST. 5-125M.

Occurrence No. 7 **Map Index:** 40647 **EO Index:** 35654

Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: VONARB, R. 1996 (OBS)

Dates Last Seen
Element: 1996-05-21
Site: 1996-05-21

Record Last Updated: 1999-01-19

Quad Summary: MONTARA MOUNTAIN (3712254/448C)

County Summary: SAN MATEO

Lat/Long: 37.53936° / -122.50533°
UTM: Zone-10 N4154823 E543700
Radius: 80 meters
Elevation: 225 ft

Mapping PrecisionSPECIFIC
Symbol Type:POINT

Township: 04S
Range: 06W
Section: 34 **Qtr:** XX
Meridian: M

Location: DEVILS SLIDE POPULATION, SE MONTARA (TOWN), 0.7 MI NE OF FARALLONE VIEW SCHOOL.

Ecological: NATIVE AND NONNATIVE GRASSLAND WITH STIPA SPP., POA SCABRELLA, DANTHONIA CA., AIRA CARYOPHYLLA, BRIZA MINOR, PLANTAGO LANCEOLATA, & LUPINUS SPP.

General: TOTAL OF 2600 PLANTS HERE AND AT OCCURRENCE #6 IN 1995; 1990 PLANTS AT BOTH OCCURRENCES IN 1996.

Owner/Manager: PVT

Rallus longirostris obsoletus

California clapper rail

Element Code: ABNME05016

Status
Federal: Endangered
State: Endangered

NDDB Element Ranks
Global: G5T1
State: S1

Other Lists
CDFG Status:

Habitat Associations
General: SALT-WATER & BRACKISH MARSHES TRAVERSED BY TIDAL SLOUGHS IN THE VICINITY OF SAN FRANCISCO BAY.
Micro: ASSOCIATED WITH ABUNDANT GROWTHS OF PICKLEWEED, BUT FEEDS AWAY FROM COVER ON INVERTEBRATES FROM MUD-BOTTOMED SLOUGHS.

Occurrence No. 43 **Map Index:** 08969 **EO Index:** 25849
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: GILL, R. 1979 (LIT)

Dates Last Seen
Element: 1975-XX-XX
Site: 1975-XX-XX
Record Last Updated: 1989-08-10

Quad Summary: SAN MATEO (3712253/448D), MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

Lat/Long: 37.59576° / -122.35970°
UTM: Zone-10 N4161158 E556523
Radius: 1 mile
Elevation:
Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT
Township: 04S
Range: 05W
Section: 12 **Qtr:** XX
Meridian: M

Location: SMALL MARSHES NEAR BURLINGAME.

General: SMALL, STABLE POPULATIONS.

Owner/Manager: UNKNOWN

Occurrence No. 46 **Map Index:** 09280 **EO Index:** 30342
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: GILL, R. 1979 (LIT)

Dates Last Seen
Element: 1975-XX-XX
Site: 1975-XX-XX
Record Last Updated: 1997-03-03

Quad Summary: REDWOOD POINT (3712252/447C), SAN MATEO (3712253/448D)
County Summary: SAN MATEO

Lat/Long: 37.54174° / -122.25080°
UTM: Zone-10 N4155235 E566185
Area: 514.5 ac
Elevation: 15 ft
Mapping PrecisionSPECIFIC
Symbol Type:POLYGON
Township: 04S
Range: 03W
Section: 36 **Qtr:** XX
Meridian: M

Location: MARSHES BORDERING BELMONT SLOUGH.

General: BREEDING POPULATIONS.

Owner/Manager: UNKNOWN

Occurrence No. 91 **Map Index:** 09153 **EO Index:** 59297
Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: BLAKE, R. 2003 (OBS)

Dates Last Seen
Element: 2003-12-10
Site: 2003-12-10
Record Last Updated: 2005-01-11

Quad Summary: SAN MATEO (3712253/448D)
County Summary: SAN MATEO

Lat/Long: 37.57322° / -122.28945°
UTM: Zone-10 N4158701 E562744
Area: 76.9 ac
Elevation:
Mapping PrecisionSPECIFIC
Symbol Type:POLYGON
Township: 04S
Range: 04W
Section: 22 **Qtr:** XX
Meridian: M

Location: EAST SIDE OF THE MOUTH OF SEAL SLOUGH, FOSTER CITY.

Ecological: HABITAT CONSISTS OF AN URBAN SALT MARSH. SPARTINA HYBRID IS ESTABLISHED AND IS QUICKLY BECOMING THE DOMINANT VEGETATION. THE SPARTINA IS MIXED WITH SALICORNIA AND DISTICHLIS. SUBSTRATE IS VERY FINE CLAY MUD.

General: 10 ADULTS OBSERVED ON 10 DEC 2003. CURRENT/SURROUNDING AREA: URBAN DEVELOPMENT.

Owner/Manager: UNKNOWN

Rana aurora draytonii

California red-legged frog

Element Code: AAABH01022

Status
Federal: Threatened
State: None

NDDB Element Ranks
Global: G4T2T3
State: S2S3

Other Lists
CDFG Status: SC

Habitat Associations
General: LOWLANDS & FOOTHILLS IN OR NEAR PERMANENT SOURCES OF DEEP WATER WITH DENSE, SHRUBBY OR EMERGENT RIPARIAN VEGETATION.
Micro: REQUIRES 11-20 WEEKS OF PERMANENT WATER FOR LARVAL DEVELOPMENT. MUST HAVE ACCESS TO ESTIVATION HABITAT.

Occurrence No. 33 **Map Index:** 17144 **EO Index:** 12149
Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: BRODE, J. 1990 (OBS)

Dates Last Seen
Element: 1990-10-12
Site: 1990-10-12
Record Last Updated: 1996-01-10

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

Lat/Long: 37.61083° / -122.39680°
UTM: Zone-10 N4162808 E553238
Radius: 1/5 mile
Elevation: 25 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT
Township: 04S
Range: 05W
Section: 3 **Qtr:** XX
Meridian: M

Location: SOUTH LOMITA CANAL, WEST OF HWY 101 - BETWEEN HWY 101 AND SOUTHERN PACIFIC RR TRACKS, OPPOSITE SFO ENTRANCE.

Location Detail: 6 LARVAE FOUND IN 40 FT WIDE DRAINAGE CANAL.

Ecological: CANAL GROWN TO CATTAILS AND OTHER SMALLER AQUATIC PLANTS. SURROUNDING AREA IS GRASS WITH SEVERAL DEPRESSIONS THAT HOLD SEASONAL WATER IN WET YEARS.

Threat: POSSIBLE DEVELOPMENT OF PARKING LOTS OR BART STATION. 1 ADULT & 1 JUVENILE BULLFROG SEEN, FIRST OBS OF BULLFROGS HERE.

General: DFG & USFWS HAVE DENIED SFO PERMISSION TO DREDGE CANAL. HAVE ONLY PERMITTED CUTTING OF CATTAILS UNTIL HCP IN PLACE. SAN FRANCIXCO GARTER SNAKE ALSO OCCURS HERE.

Owner/Manager: SFO CITY/COUNTY

Occurrence No. 38 **Map Index:** 17330 **EO Index:** 11954
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: SUDDJIAN, D. 1989 (OBS)

Dates Last Seen
Element: 1989-06-09
Site: 1989-06-09
Record Last Updated: 1991-01-22

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

Lat/Long: 37.51704° / -122.48884°
UTM: Zone-10 N4152354 E545171
Radius: 80 meters
Elevation: 75 ft
Mapping PrecisionSPECIFIC
Symbol Type:POINT
Township: 05S
Range: 06W
Section: 11 **Qtr:** XX
Meridian: M

Location: ALONG DENNISTON CREEK, APPROXIMATELY 300 M UPSTREAM FROM BRIDGEPORT DRIVE, EL GRANADA.

Location Detail: 5+ HEARD CALLING IN POND AT 11:15 AM, ALTHOUGH NONE COULD BE SEEN OR CAPTURED.

Ecological: HABITAT IS A MAN-MADE POND FILLED WITH SCIRPUS SPP AND TYPHA SPP. POND IS ADJACENT TO A WILLOW-RIPARIAN CORRIDOR AND COYOTE BUSH SCRUB.

Threat: POTENTIAL THREAT OF RESIDENTIAL DEVELOPMENT.

General: POND CONTAINED LIMITED SURFACE WATER ON SURVEY DATE.

Owner/Manager: UNKNOWN

Rana aurora draytonii

California red-legged frog

Element Code: AAABH01022

Status
Federal: Threatened
State: None

NDDB Element Ranks
Global: G4T2T3
State: S2S3

Other Lists
CDFG Status: SC

Habitat Associations
General: LOWLANDS & FOOTHILLS IN OR NEAR PERMANENT SOURCES OF DEEP WATER WITH DENSE, SHRUBBY OR EMERGENT RIPARIAN VEGETATION.
Micro: REQUIRES 11-20 WEEKS OF PERMANENT WATER FOR LARVAL DEVELOPMENT. MUST HAVE ACCESS TO ESTIVATION HABITAT.

Occurrence No. 242 **Map Index:** 38311 **EO Index:** 33318
Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: VONARB, R. 1997 (OBS)

Dates Last Seen
Element: 1997-04-16
Site: 1997-04-16
Record Last Updated: 1998-03-10

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

Lat/Long: 37.56584° / -122.51241°
UTM: Zone-10 N4157757 E543060
Radius: 80 meters
Elevation: 100 ft
Mapping PrecisionSPECIFIC
Symbol Type:POINT
Township: 04S
Range: 06W
Section: 22 **Qtr:** SW
Meridian: M

Location: GREEN VALLEY CREEK, ON THE EAST SIDE OF HWY 1, 1.5 MILES NORTH OF MONTARA

Ecological: HABITAT CONSISTS OF A SMALL POND RECEIVING OVERFLOW FROM GREEN VALLEY CREEK; PLANT DOMINANTS INCLUDE WILLOW AND JUNCUS.

General: 1 ADULT AND SOME TADPOLES OBSERVED ON 16 APRIL 1997.

Owner/Manager: DPR

Occurrence No. 243 **Map Index:** 38312 **EO Index:** 33319
Occ Rank: Excellent
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: VONARB, R. 1997 (OBS)

Dates Last Seen
Element: 1997-07-10
Site: 1997-07-10
Record Last Updated: 1998-03-10

Quad Summary: WOODSIDE (3712243/429A), HALF MOON BAY (3712244/429B)
County Summary: SAN MATEO

Lat/Long: 37.49168° / -122.37567°
UTM: Zone-10 N4149601 E555190
Radius: 80 meters
Elevation: 350 ft
Mapping PrecisionSPECIFIC
Symbol Type:POINT
Township: 05S
Range: 05W
Section: 14 **Qtr:** SE
Meridian: M

Location: ALBERT CANYON CREEK, TRIB TO PILARCITOS CREEK, ON THE NE SIDE OF HWY 92, 1 MILE WEST OF THE INTERSECTION WITH HWY 35.

Location Detail: DESCRIBED BY SAM MCGINNIS (CSU HAYWARD) AS "RANDOM WANDERING" BY AN ADULT FROG IN AN ATTEMPT TO COLONIZE A NEW SITE.

Ecological: HABITAT CONSISTS OF A DEEPER POOL IN THE CREEK; PLANT DOMINANTS INCLUDE WILLOWS.

Threat: THREATENED BY HWY 92 (LOCATED ABOVE ON FILL EMBANKMENT) CONSTRUCTION ACTIVITIES.

General: 1 ADULT OBSERVED ON 10 JULY 1997.

Owner/Manager: UNKNOWN

Occurrence No. 269 **Map Index:** 40085 **EO Index:** 35087
Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: DREIER, J. 1998 (OBS)

Dates Last Seen
Element: 1998-10-20
Site: 1998-10-20
Record Last Updated: 1998-11-04

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

Lat/Long: 37.56147° / -122.38782°
UTM: Zone-10 N4157337 E554066
Radius: 80 meters
Elevation: 600 ft
Mapping PrecisionSPECIFIC
Symbol Type:POINT
Township: 04S
Range: 05W
Section: 27 **Qtr:** XX
Meridian: M

Location: CRYSTAL SPRINGS GOLF COURSE, 0.4 MILE NE OF THE NORTH END OF LOWER CRYSTAL SPRINGS RESERVOIR, SOUTH OF HILLSBOROUGH.

Ecological: HABITAT CONSISTS OF AN IRRIGATION POND, WHICH SUPPORTS CATTAIL GROWTH ALONG THE NORTH MARGIN OF THE POND, SURROUNDED BY GOLF COURSE. POND LEVEL IS MAINTAINED BY PUMPING WATER UP FROM CRYSTAL SPRINGS RESERVOIR.

Threat: POSSIBLE THREATS INCLUDE GOLFER DISTURBANCE AND MORTALITY FROM PUMP OPERATION.

General: GOLF COURSE INTENDS TO MANAGE THE POND FOR RED-LEGGED FROGS. 2 ADULTS AND 3 JUVENILES OBSERVED ON 20 OCT 1998.

Owner/Manager: PVT-CRYSTAL SPRGS GOLF COURSE

Rana aurora draytonii

California red-legged frog

Element Code: AAABH01022

Status
Federal: Threatened
State: None

NDDB Element Ranks
Global: G4T2T3
State: S2S3

Other Lists
CDFG Status: SC

Habitat Associations
General: LOWLANDS & FOOTHILLS IN OR NEAR PERMANENT SOURCES OF DEEP WATER WITH DENSE, SHRUBBY OR EMERGENT RIPARIAN VEGETATION.
Micro: REQUIRES 11-20 WEEKS OF PERMANENT WATER FOR LARVAL DEVELOPMENT. MUST HAVE ACCESS TO ESTIVATION HABITAT.

Occurrence No. 301 **Map Index:** 41133 **EO Index:** 41133
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: COLLINS, P. 1999 (OBS)

Dates Last Seen
Element: 1999-05-07
Site: 1999-05-07
Record Last Updated: 1999-06-01

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

Lat/Long: 37.50354° / -122.49600°
UTM: Zone-10 N4150853 E544546
Radius: 80 meters
Elevation: 10 ft
Mapping PrecisionSPECIFIC
Symbol Type:POINT
Township: 05S
Range: 06W
Section: 10 **Qtr:** XX
Meridian: M

Location: UPPER END OF PRINCETON MARSH, JUST DOWNSTREAM (SOUTH) OF WEST POINT ROAD, HALF MOON BAY

Location Detail: POOLS ARELOCATED ON THE DOWNSTREAM SIDE OF THE CULVERTS LOCATED BENEATH WEST POINT ROAD.

Ecological: HABITAT CONSISTS OF RIPARIAN ON THE UPSTREAM SIDE OF WEST POINT ROAD, GRADING INTO CATTAIL MARSH, THEN SALICORNIA MARSH, ON THE DOWNSTREAM SIDE OF THE ROAD. SCOUR POOLS AT THE BASE OF THE ROAD CULVERTS ARE SURROUNDED BY CATTAILS/BULRUSH.

Threat: THREATENED BY HERBICIDE TREATMENT OF ROAD SHOULDERS.

General: 1 ADULT AND 1 SUB-ADULT OBSERVED ON 7 MAY 1999.

Owner/Manager: SMT COUNTY

Occurrence No. 504 **Map Index:** 47400 **EO Index:** 47400
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: WILKINSON, J. 2002 (OBS)

Dates Last Seen
Element: 2002-02-27
Site: 2002-02-27
Record Last Updated: 2002-03-11

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

Lat/Long: 37.61397° / -122.48965°
UTM: Zone-10 N4163108 E545041
Area: 17.9 ac
Elevation: 65 ft
Mapping PrecisionSPECIFIC
Symbol Type:POLYGON
Township: 04S
Range: 06W
Section: 02 **Qtr:** NW
Meridian: M

Location: CALERA CREEK, WEST OF HIGHWAY 1, PACIFICA

Ecological: HABITAT CONSISTS OF WILLOW RIPARIAN ALONG CALERA CREEK; UPLAND EXTENSIVELY DISTURBED DUE TO PAST QUARRY OPERATIONS.

Threat: THREATENED BY DEVELOPMENT OF FIELD NEXT TO CREEK.

General: 1 ADULT, 7 JUVENILES, AND SEVERAL TADPOLES OBSERVED ON 27 FEB 2002.

Owner/Manager: PVT

Rana aurora draytonii

California red-legged frog

Element Code: AAABH01022

Status
Federal: Threatened
State: None

NDDB Element Ranks
Global: G4T2T3
State: S2S3

Other Lists
CDFG Status: SC

Habitat Associations
General: LOWLANDS & FOOTHILLS IN OR NEAR PERMANENT SOURCES OF DEEP WATER WITH DENSE, SHRUBBY OR EMERGENT RIPARIAN VEGETATION.
Micro: REQUIRES 11-20 WEEKS OF PERMANENT WATER FOR LARVAL DEVELOPMENT. MUST HAVE ACCESS TO ESTIVATION HABITAT.

Occurrence No. 533 **Map Index:** 48456 **EO Index:** 48456
Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: LYNCH, S. AND G. MONK 2001 (OBS)

Dates Last Seen
Element: 2001-05-15
Site: 2001-05-15
Record Last Updated: 2002-08-06

Quad Summary: SAN MATEO (3712253/448D)
County Summary: SAN MATEO

Lat/Long: 37.52915° / -122.36177°
UTM: Zone-10 N4153766 E556391
Radius: 80 meters
Elevation: 300 ft
Mapping PrecisionSPECIFIC
Symbol Type:POINT
Township: 05S
Range: 05W
Section: 01 **Qtr:** XX
Meridian: M

Location: CRYSTAL SPRINGS DAM, LOWER CRYSTAL SPRINGS RESERVOIR
Location Detail:TADPOLES FOUND AT THE TOP OF THE DAM, AS WELL AS AT THE BASE.
Ecological: HABITAT CONSISTS OF CONCRETE-LINED POOLS, WITH SOME AQUATIC VEGETATION.
Threat: THREATENED BY PRESENCE OF ADULT BULLFROGS (OBSERVED DURING A DIURNAL SURVEY).
General: 20+ LARVAE (NO ADULTS) OBSERVED ON 15 MAY 2001.
Owner/Manager: SAN FRANCISCO PUC

Occurrence No. 539 **Map Index:** 48683 **EO Index:** 48683
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: VONARB, R. 2002 (OBS)

Dates Last Seen
Element: 2002-08-12
Site: 2002-08-12
Record Last Updated: 2002-08-27

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

Lat/Long: 37.57229° / -122.51485°
UTM: Zone-10 N4158471 E542841
Area: 13.0 ac
Elevation: 200 ft
Mapping PrecisionSPECIFIC
Symbol Type:POLYGON
Township: 04S
Range: 06W
Section: 22 **Qtr:** XX
Meridian: M

Location: BETWEEN DEVILS SLIDE AND GREEN VALLEY, ON THE WEST SLOPE OF MONTARA MOUNTAIN
Location Detail:DRAINAGE IS LOCATED ON THE EAST SIDE OF HIGHWAY 1. SITE IS PROPOSED FOR FUTURE ALIGNMENT FOR DEVILS SLIDE TUNNEL.
Ecological: HABITAT CONSISTS OF A DRAINAGE WITH PERMANENT WATER FLOW, WHERE THE WATER PONDS AT THE BASE OF A STANDPIPE CULVERT DURING WINTER; DOMINATED BY SCIRPUS AND SALIX.
General: 1 ADULT OBSERVED ON 16 MAY 2002; 1 JUVENILE OBSERVED ON 19 JUN 2002; 1 ADULT OBSERVED ON 12 AUG 2002.
Owner/Manager: UNKNOWN

Occurrence No. 540 **Map Index:** 50582 **EO Index:** 50582
Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: SWAIM, K. 2002 (OBS)

Dates Last Seen
Element: 2002-XX-XX
Site: 2002-XX-XX
Record Last Updated: 2003-03-13

Quad Summary: MONTARA MOUNTAIN (3712254/448C), SAN FRANCISCO SOUTH (3712264/448B)
County Summary: SAN MATEO

Lat/Long: 37.62471° / -122.45823°
UTM: Zone-10 N4164315 E547807
Area: 9.1 ac
Elevation: 580 ft
Mapping PrecisionSPECIFIC
Symbol Type:POLYGON
Township: 03S
Range: 05W
Section: 31 **Qtr:** XX
Meridian: M

Location: SAN FRANCISCO JAIL, SAN BRUNO
Ecological: HABITAT CONSISTS OF GRASSLANDS/SEASONAL WETLANDS/CEMENT TANKS.
General: 10+ ADULTS OBSERVED DURING 2002.
Owner/Manager: CITY OF SAN FRANCISCO

Rana aurora draytonii

California red-legged frog

Element Code: AAABH01022

Status		NDDB Element Ranks		Other Lists	
Federal:	Threatened	**Global:**	G4T2T3	**CDFG Status:**	SC
State:	None	**State:**	S2S3		

Habitat Associations

General: LOWLANDS & FOOTHILLS IN OR NEAR PERMANENT SOURCES OF DEEP WATER WITH DENSE, SHRUBBY OR EMERGENT RIPARIAN VEGETATION.

Micro: REQUIRES 11-20 WEEKS OF PERMANENT WATER FOR LARVAL DEVELOPMENT. MUST HAVE ACCESS TO ESTIVATION HABITAT.

Occurrence No. 555 **Map Index:** 48717 **EO Index:** 48717

Occ Rank: Excellent
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: LONG, L. 1991 (PERS)

Dates Last Seen
Element: 2005-08-01
Site: 2005-08-01
Record Last Updated: 2006-03-16

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

Lat/Long: 37.52647° / -122.39749°
UTM: Zone-10 N4153448 E553237
Area: 3.5 ac
Elevation: 500 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POLYGON
Township: 05S
Range: 05W
Section: 03 **Qtr:** XX
Meridian: M

Location: STONE DAM RESERVOIR, ON PILARCITOS CREEK, ~4 MILES NE OF EL GRANADA

Ecological: HABITAT CONSISTS OF A POND WITHIN PILARCITOS CREEK, SURROUNDED BY RIPARIAN, ALONG WITH OAK/BAY/PINE WOODLAND.

General: UNKNOWN NUMBER OF INDIVIDUALS OBSERVED ON 2 MAR 1991. 57NADULTS CAPTURE BETWEEN 25 JUN-1 AUG 2005.

Owner/Manager: SFO CITY/COUNTY(MGMT BY SFPUC)

Occurrence No. 611 **Map Index:** 50122 **EO Index:** 50122

Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: SWAIM, K. 2002 (OBS)

Dates Last Seen
Element: 2004-07-16
Site: 2004-07-16
Record Last Updated: 2005-06-13

Quad Summary: WOODSIDE (3712243/429A)
County Summary: SAN MATEO

Lat/Long: 37.48235° / -122.31964°
UTM: Zone-10 N4148601 E560151
Area: 24.0 ac
Elevation: 300 ft
Mapping PrecisionSPECIFIC
Symbol Type:POLYGON
Township: 05S
Range: 04W
Section: 20 **Qtr:** XX
Meridian: M

Location: LAGUNA CREEK AND PULGAS WATER TEMPLE, AT THE SOUTH END OF UPPER CRYSTAL SPRINGS RESERVOIR, 4 MILES NW OF REDWOOD CITY

Ecological: HABITAT CONSISTS OF A PLUNGE POOL BELOW A CULVERT AND WILLOW RIPARIAN ALONG LAGUNA CREEK.

Threat: FLUME PRESENTS A THREAT TO ADULT FROGS GETTING TRAPPED.

General: 1 ADULT OBSERVED IN LAGUNA CREEK IN SPRING 2002; 1 ADULT FOUND TRAPPED IN THE FLUME BETWEEN WATER TEMPLE AND RESERVOIR IN NOV 2002. 1 ADULT OBSERVED BETWEEN 26 MAY & 16 JUL 2004.

Owner/Manager: SFO CITY/COUNTY(MGMT BY SFPUC)

Occurrence No. 652 **Map Index:** 51519 **EO Index:** 51519

Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: LA CIVITA, P. 2002 (OBS)

Dates Last Seen
Element: 2002-XX-XX
Site: 2002-XX-XX
Record Last Updated: 2003-06-11

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

Lat/Long: 37.59232° / -122.50371°
UTM: Zone-10 N4160699 E543813
Area: 38.2 ac
Elevation: 40 ft
Mapping PrecisionSPECIFIC
Symbol Type:POLYGON
Township: 04S
Range: 06W
Section: 10 **Qtr:** XX
Meridian: M

Location: SAN PEDRO CREEK, FROM THE MOUTH EXTENDING 0.5 MILE UPSTREAM, SAN PEDRO VALLEY IN PACIFICA

Ecological: HABITAT CONSISTS OF AN EARTHEN, PARTIALLY ARMORED FLOOD CONTROL CHANNEL; VEGETATED BY WILLOWS, ALDERS, AND RUDERAL.

General: 5 FROGS COLLECTED DURING 2002 AND DEPOSITED AT CAS.

Owner/Manager: CITY OF PACIFICA

Rana aurora draytonii

California red-legged frog

Element Code: AAABH01022

Status

Federal: Threatened
State: None

NDDB Element Ranks

Global: G4T2T3
State: S2S3

Other Lists

CDFG Status: SC

Habitat Associations

General: LOWLANDS & FOOTHILLS IN OR NEAR PERMANENT SOURCES OF DEEP WATER WITH DENSE, SHRUBBY OR EMERGENT RIPARIAN VEGETATION.
Micro: REQUIRES 11-20 WEEKS OF PERMANENT WATER FOR LARVAL DEVELOPMENT. MUST HAVE ACCESS TO ESTIVATION HABITAT.

Occurrence No. 775 **Map Index:** 58520 **EO Index:** 58556
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: CAL ACADEMY OF SCIENCES 2003 (MUS)

Dates Last Seen
Element: 2003-03-14
Site: 2003-03-14
Record Last Updated: 2004-12-13

Quad Summary: WOODSIDE (3712243/429A)
County Summary: SAN MATEO

Lat/Long: 37.42236° / -122.32752°
UTM: Zone-10 N4141940 E559501
Radius: 80 meters
Elevation: 1,880 ft
Mapping PrecisionSPECIFIC
Symbol Type:POINT
Township: 06S
Range: 04W
Section: 08 **Qtr:** XX
Meridian: M

Location: TUNITAS CREEK ROAD, 6.5 MILES SE OF HALF MOON BAY
Location Detail: 150 METERS EAST OF 905 TUNITAS CREEK ROAD.
General: 1 ADULT COLLECTED (CAS 228057) ON 14 MAR 2003. FROG WAS DEAD ON ROAD.
Owner/Manager: UNKNOWN

Occurrence No. 830 **Map Index:** 61566 **EO Index:** 61602
Occ Rank: Excellent
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: SWAIM, K. 2004 (OBS)

Dates Last Seen
Element: 2005-08-03
Site: 2005-08-03
Record Last Updated: 2006-03-16

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

Lat/Long: 37.55609° / -122.41789°
UTM: Zone-10 N4156723 E551413
Area: 10.1 ac
Elevation: 640 ft
Mapping PrecisionSPECIFIC
Symbol Type:POLYGON
Township: 04S
Range: 05W
Section: 28 **Qtr:** XX
Meridian: M

Location: MUD DAM, ON SAN MATEO CREEK, EAST OF PILARCITOS LAKE
Ecological: HABITAT CONSISTS OF A POND, SURROUNDED BY RIPARIAN AND OAK, BAY, AND PINE WOODLAND.
General: 8 ADULTS CAPTURED BETWEEN 29 MAY-19 JUL 2004. 117 ADULTS CAPTURED BETWEEN 29 JUL-3 AUG 2005.
Owner/Manager: SFO CITY/COUNTY(MGMT BY SFPUC)

Occurrence No. 831 **Map Index:** 61567 **EO Index:** 61603
Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: SWAIM, K. 2004 (OBS)

Dates Last Seen
Element: 2004-06-18
Site: 2004-06-18
Record Last Updated: 2005-06-13

Quad Summary: MONTARA MOUNTAIN (3712254/448C), SAN FRANCISCO SOUTH (3712264/448B)
County Summary: SAN MATEO

Lat/Long: 37.62291° / -122.49358°
UTM: Zone-10 N4164098 E544688
Area: 25.2 ac
Elevation: 5 ft
Mapping PrecisionSPECIFIC
Symbol Type:POLYGON
Township: 03S
Range: 06W
Section: 35 **Qtr:** XX
Meridian: M

Location: SHARP PARK GOLF COURSE VICINITY, NE OF MORI POINT, PACIFICA
Location Detail: HORSE STABLE POND AND LAGUNA SALADA
Ecological: HABITAT CONSISTS OF A WETLANDS, RIPARIAN, AND COASTAL SCRUB.
General: 7 ADULTS CAPTURED BETWEEN 28 MAY-18 JUN 2004.
Owner/Manager: NPS-GGNRA

Rana aurora draytonii

California red-legged frog

Element Code: AAABH01022

Status
Federal: Threatened
State: None

NDDB Element Ranks
Global: G4T2T3
State: S2S3

Other Lists
CDFG Status: SC

Habitat Associations
General: LOWLANDS & FOOTHILLS IN OR NEAR PERMANENT SOURCES OF DEEP WATER WITH DENSE, SHRUBBY OR EMERGENT RIPARIAN VEGETATION.
Micro: REQUIRES 11-20 WEEKS OF PERMANENT WATER FOR LARVAL DEVELOPMENT. MUST HAVE ACCESS TO ESTIVATION HABITAT.

Occurrence No. 832 **Map Index:** 61568 **EO Index:** 61604
Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: SWAIM, K. 2004 (OBS)

Dates Last Seen
Element: 2005-07-28
Site: 2005-07-28
Record Last Updated: 2006-03-16

Quad Summary: SAN MATEO (3712253/448D)
County Summary: SAN MATEO

Lat/Long: 37.50650° / -122.36113°
UTM: Zone-10 N4151254 E556464
Area: 11.3 ac
Elevation: 4,005 ft
Mapping PrecisionSPECIFIC
Symbol Type:POLYGON
Township: 05S
Range: 05W
Section: 12 **Qtr:** XX
Meridian: M

Location: SKYLINE QUARRY, WEST OF CRYSTAL SPRINGS RESERVOIR AND NORTH OF SKYLINE BOULEVARD, WEST OF SAN MATEO
Ecological: HABITAT CONSISTS OF A WETLAND AND SCRUB.
Threat: POSSIBLE THREAT FROM BULLFROGS.
General: 2 ADULTS CAPTURED ON 27 AND 29 MAY 2004, AND 1 JUVENILE CAPTURED ON 17 NOV 2004. 2 ADULTS CAPTURED ON 28 JUL 2005.
Owner/Manager: SFO CITY/COUNTY(MGMT BY SFPUC)

Occurrence No. 853 **Map Index:** 63462 **EO Index:** 63554
Occ Rank: Excellent
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: KNIGHT, W. 2001 (OBS)

Dates Last Seen
Element: 2001-06-18
Site: 2001-06-18
Record Last Updated: 2005-12-22

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

Lat/Long: 37.51125° / -122.46946°
UTM: Zone-10 N4151722 E546886
Radius: 80 meters
Elevation: 220 ft
Mapping PrecisionSPECIFIC
Symbol Type:POINT
Township: 05S
Range: 06W
Section: 12 **Qtr:** XX
Meridian: M

Location: JUST NORTH OF EL GRANADA
Location Detail: SITE LIES UPON A LARGE, PRIVATELY-OWNED PARCEL WITH THE POTENTIAL FOR ONE SINGLE FAMILY DWELLING TO BE CONSTRUCTED.
Ecological: HABITAT CONSISTS OF A POND AND ASSOCIATED WETLAND AREA, CONTAINING A LARGE STAND OF CATTAILS; SURROUNDED BY RIPARIAN VEGETATION.
Threat: THREATENED BY BULLFROGS AND FERAL DOMESTIC ANIMALS.
General: 1 ADULT OBSERVED ON 18 JUN 2001.
Owner/Manager: PVT

Occurrence No. 866 **Map Index:** 64283 **EO Index:** 64362
Occ Rank: Excellent
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: SWAIM, K. 2005 (OBS)

Dates Last Seen
Element: 2005-08-01
Site: 2005-08-01
Record Last Updated: 2006-03-16

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

Lat/Long: 37.54785° / -122.40655°
UTM: Zone-10 N4155816 E552421
Radius: 80 meters
Elevation: 525 ft
Mapping PrecisionSPECIFIC
Symbol Type:POINT
Township: 04S
Range: 05W
Section: 33 **Qtr:** XX
Meridian: M

Location: SAN MATEO CREEK, BETWEEN PILARCITOS LAKE AND LOWER CRYSTAL SPRINGS RESERVOIR, WEST OF HILLSBOROUGH
Ecological: HABITAT CONSISTS OF A POND WITHIN SAN MATEO CREEK, SURROUNDED BY RIPARIAN, ALONG WITH OAK/BAY/PINE WOODLAND.
General: 46 ADULTS CAPTURED BETWEEN 25 JUN-01 AUG 2005.
Owner/Manager: SFO CITY/COUNTY(MGMT BY SFPUC)

Rana aurora draytonii

California red-legged frog

Element Code: AAABH01022

Status		NDDB Element Ranks		Other Lists	
Federal:	Threatened	**Global:**	G4T2T3	**CDFG Status:**	SC
State:	None	**State:**	S2S3		

Habitat Associations

General: LOWLANDS & FOOTHILLS IN OR NEAR PERMANENT SOURCES OF DEEP WATER WITH DENSE, SHRUBBY OR EMERGENT RIPARIAN VEGETATION.

Micro: REQUIRES 11-20 WEEKS OF PERMANENT WATER FOR LARVAL DEVELOPMENT. MUST HAVE ACCESS TO ESTIVATION HABITAT.

Occurrence No. 874 **Map Index:** 64633 **EO Index:** 64712

Dates Last Seen
Element: 2005-11-15
Site: 2005-11-15

Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: THOMAS, D. 2005 (OBS)

Record Last Updated: 2006-05-04

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

Lat/Long: 37.60370° / -122.42809°
UTM: Zone-10 N4162000 E550481
Radius: 1/10 mile
Elevation: 480 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT
Township: 04S
Range: 05W
Section: 08 **Qtr:** XX
Meridian: M

Location: EAST SIDE OF CRYSTAL SPRINGS RESERVOIR, NEAR THE JUNCTION OF I-280 AND SKYLINE BOULEVARD,

Ecological: HABITAT CONSISTS OF A LARGE WETLAND.

Threat: THREATENED BY NEARBY TRAFFIC.

General: 1 ADULT OBSERVED ON 15 NOV 2005.

Owner/Manager: SFO CITY/COUNTY(MGMT BY SFPUC)

Reithrodontomys raviventris

salt-marsh harvest mouse

Element Code: AMAFF02040

Status		NDDB Element Ranks		Other Lists	
Federal:	Endangered	**Global:**	G1G2	**CDFG Status:**	
State:	Endangered	**State:**	S1S2		

Habitat Associations

General: ONLY IN THE SALINE EMERGENT WETLANDS OF SAN FRANCISCO BAY AND ITS TRIBUTARIES.

Micro: PICKLEWEED IS PRIMARY HABITAT. DO NOT BURROW, BUILD LOOSELY ORGANIZED NESTS. REQUIRE HIGHER AREAS FOR FLOOD ESCAPE.

Occurrence No. 57 **Map Index:** 09196 **EO Index:** 23863

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: FISLER, G. (MUS)

Dates Last Seen
Element: 1960-04-30
Site: 1960-04-30

Record Last Updated: 1989-08-10

Quad Summary: SAN MATEO (3712253/448D)
County Summary: SAN MATEO

Lat/Long: 37.53243° / -122.27442°
UTM: Zone-10 N4154186 E564106
Radius: 1/5 mile
Elevation:
Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT
Township: 05S
Range: 04W
Section: 02 **Qtr:** NW
Meridian: M

Location: MARSH BETWEEN ONEILL SLOUGH AND BAYSHORE FREEWAY, FOSTER CITY.

General: MVZ SPECIMENS #130063-130072 COLLECTED HERE DURING 1960.

Owner/Manager: UNKNOWN

Serpentine Bunchgrass

Element Code: CTT42130CA

Status		NDDB Element Ranks		Other Lists
Federal:	None	**Global:**	G2	
State:	None	**State:**	S2.2	

Habitat Associations

General:

Micro:

Occurrence No.	3	**Map Index:** 09172	**EO Index:** 1261	**Dates Last Seen**	
Occ Rank:	Excellent			**Element:**	1987-04-05
Origin:	Natural/Native occurrence			**Site:**	1987-04-05
Presence:	Presumed Extant				
Trend:	Unknown			**Record Last Updated:**	1998-07-14
Main Source:	MC CARTEN, N. 1986 (LIT)				

Quad Summary: WOODSIDE (3712243/429A)

County Summary: SAN MATEO

Lat/Long:	37.46232° / -122.28400°		**Township:**	05S	
UTM:	Zone-10 N4146401 E563319		**Range:**	04W	
Radius:	1 mile	**Mapping Precision**NON-SPECIFIC	**Section:**	27	**Qtr:** XX
Elevation:	600 ft	**Symbol Type:**POINT	**Meridian:**	M	

Location: EDGEWOOD PARK & THE TRIANGLE TO W ACROSS HWY 280. W OF REDWOOD CITY.

Location Detail: 2 FORMERLY CONTIGUOUS AREAS. IN MOSAIC W/ OTHER SERPENTINE COMMUNITIES: CHAPARRAL, WILDFLOWER FIELDS, BARRENS.

Ecological: GRASSES INCL DANTHONIA CALIFORNICA, DESCHAMPSIA DANTHOIDES, ELYMUS GLAUCUS, HORDEUM BRACHYANTHERUM, KOELERIA MACRANTHA, MELICA CALIFORNICA. MANY NATIVE HERBACEOUS TAXA PRESENT.

Threat: PART THREATENED BY CONVERSION TO GOLF COURSE.

General: MORE ECOLOGY INFO IN COR91F03. THIS WAS OCC #003 OF CTT42130CA.

Owner/Manager: SMT COUNTY, OTHER?

Occurrence No.	4	**Map Index:** 08980	**EO Index:** 8498	**Dates Last Seen**	
Occ Rank:	Excellent			**Element:**	1987-04-05
Origin:	Natural/Native occurrence			**Site:**	1991-05-XX
Presence:	Presumed Extant				
Trend:	Unknown			**Record Last Updated:**	1998-07-14
Main Source:	MCCARTEN, N. 1986 (LIT)				

Quad Summary: SAN MATEO (3712253/448D)

County Summary: SAN MATEO

Lat/Long:	37.51638° / -122.34614°		**Township:**	05S	
UTM:	Zone-10 N4152359 E557782		**Range:**	04W	
Area:	196.7 ac	**Mapping Precision**SPECIFIC	**Section:**	7	**Qtr:** XX
Elevation:	350 ft	**Symbol Type:**POLYGON	**Meridian:**	M	

Location: PULGAS RIDGE EAST OF UPPER AND LOWER CRYSTAL SPRINGS RESERVOIR. MANAGED BY SAN FRANCISCO WATER DEPARTMENT.

Ecological: EXTENSIVE NATIVE BUNCHGRASS HUMMOCKS INCL NASSELLA PULCHRA, POA SCABRELLA, SITANION HYSTRIX, CALAMOGROSTIS OPHITIDIS, KOELERIA MACRANTHA, FRITTILARIA LILIACEA, ERYSIMUM FRANCISCANUM. HESPEROLINON CONGESTUM, BRODIAEA SP.

Threat: LITTLE DISTURBANCE BUT SURROUNDED BY ROADS & FWY. A TRAIL SYSTEM IS SUGGESTED FOR THIS AREA WHICH MAY NEGATIVELY IMPACT.

General: SOILS ARE SERPENTINE DERIVED OBISPO CLAY AND FAGAN LOAM. BAY CHECKERSPOT BUTTERFLIES ARE IN THIS AREA, AS ARE S.F. GARTER SNAKES. THIS WAS OCC #004 OF CTT42130CA.

Owner/Manager: SFO CITY/COUNTY(MGMT BY SFPUC)

Serpentine Bunchgrass

Element Code: CTT42130CA

Status
Federal: None
State: None

NDDB Element Ranks
Global: G2
State: S2.2

Other Lists

Habitat Associations
General:
Micro:

Occurrence No. 5 **Map Index:** 08943 **EO Index:** 19535
Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: MCCARTEN, N. 1986 (LIT)

Dates Last Seen
Element: 1986-XX-XX
Site: 1991-08-05
Record Last Updated: 1998-07-14

Quad Summary: SAN MATEO (3712253/448D), MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

Lat/Long: 37.54049° / -122.36885°
UTM: Zone-10 N4155020 E555757
Area: 150.5 ac
Elevation: 500 ft
Mapping Precision NON-SPECIFIC
Symbol Type: POLYGON
Township: 04S
Range: 05W
Section: 36 **Qtr:** XX
Meridian: M

Location: EAST OF LOWER CRYSTAL SPRINGS RESERVOIR ON BURI BURI RIDGE. MANAGED BY SAN FRANCISCO WATER DEPARTMENT

Location Detail: ONE LARGE PATCH NW OF CRYSTAL SPRINGS DAM, SE OF CRYSTAL SPRINGS GOLF COURSE.

Ecological: NASSELLA PULCHRA, ELYMUS MULTISETUS, KOELERIA MACRANTHA, HORDEUM BRACHYANTHERUM, MELICA CALIFORNICA. SOME INVASION OF EXOTIC SPECIES DUE TO ROAD CONST. SOME BACHARIS SUCCESSION IS BEGINNING IN NON-SERP. AREAS.

Threat: SOME EXOTIC INVASION.

General: SERPENTINE SEEP VEGETATION KNOWN FROM THE AREA. THIS WAS OCC #005 OF CTT42130CA.

Owner/Manager: SFO CITY/COUNTY(MGMT BY SFPUC)

Occurrence No. 23 **Map Index:** 20939 **EO Index:** 9170
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: CORELLI, T. 1991 (OBS)

Dates Last Seen
Element: 1991-05-08
Site: 1991-05-08
Record Last Updated: 1998-07-14

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

Lat/Long: 37.57103° / -122.39738°
UTM: Zone-10 N4158392 E553215
Area: 100.3 ac
Elevation: 500 ft
Mapping Precision NON-SPECIFIC
Symbol Type: POLYGON
Township: 04S
Range: 05W
Section: 22 **Qtr:** XX
Meridian: M

Location: BURI BURI RIDGE, SE OF SAN ANDREAS LAKE, NORTH OF THE CRYSTAL SPRINGS GOLF COURSE. MANAGED BY SAN FRANCISCO WATER DEPT.

Location Detail: SW FACING SLOPE AT THE CREST OF THE RIDGE STRETCHING OVER A MILE.

Ecological: SERPENTINE SUBSTRATE SURROUNDED BY OTHER SUBSTRATES. ISLANDS OF SERPENTINE GRASSLAND DOMINATED BY NASSELLA PULCHRA, BRODIAEA TERRESTRUS, SISYRINCHIUM BELLUM, DELPHINIUM HESPERIUM, ESCHSCHOLZIA CALIFORNICA, CLARKIA PURPUREA, MADIA SP.

General: AREA CLOSED TO PUBLIC AND FENCED. OWNED BY CITY OF SAN FRANCISCO WATER DISTRICT. THIS WAS OCC #023 OF CTT42130CA.

Owner/Manager: SFO CITY/COUNTY(MGMT BY SFPUC)

Silene verecunda ssp. verecunda

San Francisco campion

Element Code: PDCAR0U213

Status
Federal: None
State: None

NDDB Element Ranks
Global: G5T2
State: S2.2

Other Lists
CNPS List: 1B
R-E-D Code: 3-2-3

Habitat Associations
General: COASTAL SCRUB, VALLEY AND FOOTHILL GRASSLAND, COASTAL BLUFF SCRUB, CHAPARRAL, COASTAL PRAIRIE.
Micro: OFTEN ON MUDSTONE OR SHALE; ONE SITE ON SERPENTINE. 30-645M.

Occurrence No. 10 **Map Index:** 09178 **EO Index:** 21263
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Possibly Extirpated
Trend: Unknown
Main Source: SAN MATEO CO. 1984 (LIT)

Dates Last Seen
Element: 1983-XX-XX
Site: 1988-XX-XX
Record Last Updated: 2005-02-28

Quad Summary: WOODSIDE (3712243/429A)
County Summary: SAN MATEO

Lat/Long: 37.46612° / -122.27923°
UTM: Zone-10 N4146827 E563737
Radius: 80 meters
Elevation: 600 ft
Mapping PrecisionSPECIFIC
Symbol Type:POINT
Township: 05S
Range: 04W
Section: 27 **Qtr:** SE
Meridian: M

Location: EDGEWOOD COUNTY PARK.

Ecological: IN SERPENTINE GRASSLAND.

Threat: POSSIBLE IMPACT DUE TO PARK DEVELOPMENT.

General: OBSERVED IN 1981 AND 1983. DOUBT EXISTS ABOUT THE IDENTIFICATION. NO PLANTS WERE OBSERVED DURING 5 ANNUAL SURVEYS FROM 1984 THROUGH 1988.

Owner/Manager: SMT COUNTY

Occurrence No. 11 **Map Index:** 60218 **EO Index:** 60254
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: DUDLEY, W. SN DS #62473 (HERB)

Dates Last Seen
Element: 1900-03-17
Site: 1900-03-17
Record Last Updated: 2005-02-24

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

Lat/Long: 37.53877° / -122.44555°
UTM: Zone-10 N4154787 E548981
Radius: 1 mile
Elevation: 1,500 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT
Township: 04S
Range: 05W
Section: 31 **Qtr:** XX
Meridian: M

Location: MONTARA MOUNTAIN. BY GRADE, SOUTH SLOPE NEAR TOP.

Location Detail: EXACT LOCATION UNKNOWN. MAPPED BY CNDDB AS BEST GUESS.

General: DESCRIPTION OF SITE IS SO VAGUE THAT IS IT POSSIBLE THE ACTUAL LOCATION IS OUTSIDE OF THE 1 MILE RADIUS. ONLY SOURCE OF INFO FOR THIS SITE IS A 1900 COLLECTION BY DUDLEY. NEEDS FIELDWORK.

Owner/Manager: UNKNOWN

Speyeria zerene myrtleae

Myrtle's silverspot

Element Code: IILEPJ6089

Status
Federal: Endangered
State: None

NDDB Element Ranks
Global: G5T1
State: S1

Other Lists
CDFG Status:

Habitat Associations
General: RESTRICTED TO THE FOGGY, COASTAL DUNES/HILLS OF THE POINT REYES PENINSULA; EXTIRPATED FROM COASTAL SAN MATEO COUNTY.
Micro: LARVAL FOODPLANT THOUGHT TO BE VIOLA ADUNCA.

Occurrence No. 12 **Map Index:** 43750 **EO Index:** 43750
Occ Rank: None
Origin: Natural/Native occurrence
Presence: Possibly Extirpated
Trend: Unknown
Main Source: ANONYMOUS NO DATE (PERS)

Dates Last Seen
Element: XXXX-XX-XX
Site: XXXX-XX-XX
Record Last Updated: 2000-09-14

Quad Summary: SAN MATEO (3712253/448D)
County Summary: SAN MATEO

Lat/Long: 37.56330° / -122.32206°
UTM: Zone-10 N4157580 E559872
Radius: 1 mile
Elevation: 22 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT
Township: 04S
Range: 04W
Section: 20 **Qtr:** XX
Meridian: M

Location: SAN MATEO.

General: COLLECTION SITE OF THE TYPE LOCALITY.

Owner/Manager: UNKNOWN

Occurrence No. 13 **Map Index:** 43751 **EO Index:** 43751
* SENSITIVE *
Occ Rank: None
Origin: Natural/Native occurrence
Presence: Extirpated
Trend: Unknown
Main Source: ANONYMOUS NO DATE (PERS)

Dates Last Seen
Element: XXXX-XX-XX
Site: XXXX-XX-XX
Record Last Updated: 2000-09-14

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

* SENSITIVE *
Lat/Long:
UTM:
Radius:
Elevation:
Mapping Precision:
Symbol Type:
Township:
Range:
Section: **Qtr:**
Meridian:

Location: *SENSITIVE* Location information suppressed.
Location Detail: Please contact the Calfornia Natural Diversity Database, California Department of Fish and Game, for more information: (916) 324-3812.

Owner/Manager:

Taxidea taxus

American badger

Element Code: AMAJF04010

Status		**NDDB Element Ranks**		**Other Lists**	
Federal:	None	**Global:**	G5	**CDFG Status:**	SC
State:	None	**State:**	S4		

Habitat Associations

General: MOST ABUNDANT IN DRIER OPEN STAGES OF MOST SHRUB, FOREST, AND HERBACEOUS HABITATS, WITH FRIABLE SOILS.

Micro: NEED SUFFICIENT FOOD, FRIABLE SOILS & OPEN, UNCULTIVATED GROUND. PREY ON BURROWING RODENTS. DIG BURROWS.

Occurrence No. 127 **Map Index:** 56775 **EO Index:** 56791

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: CAS 2004 (MUS)

Dates Last Seen
Element: 1948-05-01
Site: 1948-05-01

Record Last Updated: 2004-09-14

Quad Summary: MONTARA MOUNTAIN (3712254/448C)

County Summary: SAN MATEO

Lat/Long: 37.56131° / -122.48451°
UTM: Zone-10 N4157268 E545527
Radius: 3/5 mile
Elevation: 1,500 ft

Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT

Township: 04S
Range: 06W
Section: 26 **Qtr:** XX
Meridian: M

Location: VICINITY OF PEAK MTN., SAN MATEO COUNTY.

Location Detail: 1933: SAN FRANCISCO GAME REFUGE, SAN MATEO COUNTY. 1948: NEAR PEAK MTN., SAN MATEO COUNTY.

General: 1 MALE COLLECTED (CAS #59754) BY J. N. RAY ON 30 SEP 1933. 1 MALE COLLECTED (CAS #59755) BY J. N. RAY ON 7 OCT 1933. 1 INDIVIDUAL COLLECTED (CAS #11824) BY T. J. MERKEL ON 1 MAY 1948.

Owner/Manager: UNKNOWN

Thamnophis sirtalis tetrataenia

San Francisco garter snake

Element Code: ARADB3613B

Status		NDDB Element Ranks		Other Lists	
Federal:	Endangered	**Global:**	G5T2	**CDFG Status:**	
State:	Endangered	**State:**	S2		

Habitat Associations

General: VICINITY OF FRESHWATER MARSHES, PONDS AND SLOW MOVING STREAMS IN SAN MATEO COUNTY AND EXTREME NORTHERN SANTA CRUZ COUNTY

Micro: PREFERS DENSE COVER & WATER DEPTHS OF AT LEAST ONE FOOT. UPLAND AREAS NEAR WATER ARE ALSO VERY IMPORTANT.

---

* SENSITIVE *

Occurrence No. 2 **Map Index:** 09024 **EO Index:** 14768

Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: MCGINNIS, S. 1987 (OBS & MAP)

Dates Last Seen
Element: 2005-05-11
Site: 2005-05-11
Record Last Updated: 2006-03-28

Quad Summary: WOODSIDE (3712243/429A), SAN MATEO (3712253/448D)
County Summary: SAN MATEO

* SENSITIVE *

Lat/Long:
UTM:
Radius:
Elevation:
Mapping Precision:
Symbol Type:
Township:
Range:
Section: **Qtr:**
Meridian:

Location: *SENSITIVE* Location information suppressed.

Location Detail: Please contact the Calfornia Natural Diversity Database, California Department of Fish and Game, for more information: (916) 324-3812

Ecological: MARSH AREAS ALONG RESERVOIR EDGE, CREATED BY CREEK IN-FLOWS. VEG VARIES FROM CATTAILS, REED-SHRUB HABITAT TO GRASSLAND, AND COASTAL SCRUB. ALSO, RIPARIAN, OAK-BAY-PINE WOODLAND. MAJOR PREY: PACIFIC TREE FROG.

Threat: LAKE DRAW-DOWN AND FLOODING, VEHICULAR TRAFFIC.

Owner/Manager:

---

* SENSITIVE *

Occurrence No. 5 **Map Index:** 08913 **EO Index:** 27539

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: BARRY, S. 1978 (LIT)

Dates Last Seen
Element: 1975-05-XX
Site: 1975-05-XX
Record Last Updated: 1996-01-11

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

* SENSITIVE *

Lat/Long:
UTM:
Radius:
Elevation:
Mapping Precision:
Symbol Type:
Township:
Range:
Section: **Qtr:**
Meridian:

Location: *SENSITIVE* Location information suppressed.

Location Detail: Please contact the Calfornia Natural Diversity Database, California Department of Fish and Game, for more information: (916) 324-3812.

Owner/Manager:

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* SENSITIVE *

Occurrence No. 7 **Map Index:** 08582 **EO Index:** 27540

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Decreasing
Main Source: BARRY, S. 1978 (LIT)

Dates Last Seen
Element: 1989-06-09
Site: 1989-06-09
Record Last Updated: 1991-07-16

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

* SENSITIVE *

Lat/Long:
UTM:
Radius:
Elevation:
Mapping Precision:
Symbol Type:
Township:
Range:
Section: **Qtr:**
Meridian:

Location: *SENSITIVE* Location information suppressed.

Location Detail: Please contact the Calfornia Natural Diversity Database, California Department of Fish and Game, for more information: (916) 324-3812.

Ecological: WILLOW RIPARIAN CORRIDOR ADJACENT TO GRASSLAND, COYOTE BUSH SCRUB.

Threat: PROPOSED DREDGING & DEEPENING OF EXISTING RESERVOIR TO PROVIDE MORE WATER FOR COASTAL DEVELOPMENT.

Owner/Manager:

Thamnophis sirtalis tetrataenia

San Francisco garter snake

Element Code: ARADB3613B

Status
Federal: Endangered
State: Endangered

NDDB Element Ranks
Global: G5T2
State: S2

Other Lists
CDFG Status:

Habitat Associations
General: VICINITY OF FRESHWATER MARSHES, PONDS AND SLOW MOVING STREAMS IN SAN MATEO COUNTY AND EXTREME NORTHERN SANTA CRUZ COUNTY
Micro: PREFERS DENSE COVER & WATER DEPTHS OF AT LEAST ONE FOOT. UPLAND AREAS NEAR WATER ARE ALSO VERY IMPORTANT.

*** SENSITIVE ***

Occurrence No. 9 **Map Index:** 08586 **EO Index:** 27538
Occ Rank: Poor
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Decreasing
Main Source: BARRY, S. 1978 (LIT)

Dates Last Seen
Element: 1997-07-17
Site: 1997-07-17
Record Last Updated: 1997-08-18

Quad Summary: MONTARA MOUNTAIN (3712254/448C), SAN FRANCISCO SOUTH (3712264/448B)
County Summary: SAN MATEO

*** SENSITIVE ***
Lat/Long:
UTM:
Radius:
Elevation:
Mapping Precision:
Symbol Type:
Township:
Range:
Section: **Qtr:**
Meridian:

Location: *SENSITIVE* Location information suppressed.
Location Detail: Please contact the Calfornia Natural Diversity Database, California Department of Fish and Game, for more information: (916) 324-3812.
Ecological: HABITAT CONSISTS OF FRESHWATER MARSH.
Threat: HABITAT DEGRADATION, HUMAN DISTURBANCE, AND OVERCOLLECTING CAUSED A PRECIPITOUS DECLINE IN THIS POP.
Owner/Manager:

*** SENSITIVE ***

Occurrence No. 10 **Map Index:** 08937 **EO Index:** 27537
Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: MCGINNIS, S. 1987 (OBS & MAP)

Dates Last Seen
Element: 1987-05-05
Site: 1987-05-05
Record Last Updated: 1989-08-10

Quad Summary: SAN MATEO (3712253/448D), MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

*** SENSITIVE ***
Lat/Long:
UTM:
Radius:
Elevation:
Mapping Precision:
Symbol Type:
Township:
Range:
Section: **Qtr:**
Meridian:

Location: *SENSITIVE* Location information suppressed.
Location Detail: Please contact the Calfornia Natural Diversity Database, California Department of Fish and Game, for more information: (916) 324-3812.
Ecological: OLD RESERVOIR POND W/LOTS OF FLOATING AQ VEG & GOOD SHORE COVER. LARGE BULLFROG POP.
Threat: COLLECTING. SURROUNDING AREAS ARE URBANIZED.
Owner/Manager:

*** SENSITIVE ***

Occurrence No. 11 **Map Index:** 08841 **EO Index:** 14767
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: BARRY, S. 1978 (LIT)

Dates Last Seen
Element: 2005-11-17
Site: 2005-11-17
Record Last Updated: 2006-03-27

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

*** SENSITIVE ***
Lat/Long:
UTM:
Radius:
Elevation:
Mapping Precision:
Symbol Type:
Township:
Range:
Section: **Qtr:**
Meridian:

Location: *SENSITIVE* Location information suppressed.
Location Detail: Please contact the Calfornia Natural Diversity Database, California Department of Fish and Game, for more information: (916) 324-3812.
Ecological: RESERVOIR RECEDES DRASTICALLY EVERY YEAR FROM ITS SPRING HIGH LEVEL.
Owner/Manager:

Thamnophis sirtalis tetrataenia

San Francisco garter snake

Element Code: ARADB3613B

Status		NDDB Element Ranks		Other Lists	
Federal:	Endangered	**Global:**	G5T2	**CDFG Status:**	
State:	Endangered	**State:**	S2		

Habitat Associations

General: VICINITY OF FRESHWATER MARSHES, PONDS AND SLOW MOVING STREAMS IN SAN MATEO COUNTY AND EXTREME NORTHERN SANTA CRUZ COUNTY

Micro: PREFERS DENSE COVER & WATER DEPTHS OF AT LEAST ONE FOOT. UPLAND AREAS NEAR WATER ARE ALSO VERY IMPORTANT.

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* SENSITIVE *

Occurrence No. 13 **Map Index:** 08901 **EO Index:** 27531

Occ Rank: Excellent
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Increasing
Main Source: MCGINNIS, S. 1984 (LIT)

Dates Last Seen
Element: 2003-09-XX
Site: 2003-09-XX
Record Last Updated: 2004-03-22

Quad Summary: MONTARA MOUNTAIN (3712254/448C), SAN FRANCISCO SOUTH (3712264/448B)
County Summary: SAN MATEO

* SENSITIVE *

Lat/Long:
UTM:
Radius:
Elevation:
Mapping Precision:
Symbol Type:
Township:
Range:
Section: **Qtr:**
Meridian:

Location: *SENSITIVE* Location information suppressed.

Location Detail: Please contact the Calfornia Natural Diversity Database, California Department of Fish and Game, for more information: (916) 324-3812.

Ecological: HABITAT CONSISTS OF PERMANENT FRESHWATER CANALS/MARSHES. SITE IS UNGRAZED/UNMOWED, WITH LUSH REED/GRASS/BRUSH COVERING BORDERS OF WATERWAYS. EXCELLENT FOOD BASE: PACIFIC TREE FROGS, RED-LEGGED FROGS, AND SMALL FISH.

Owner/Manager:

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* SENSITIVE *

Occurrence No. 26 **Map Index:** 08583 **EO Index:** 27515

Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: MCGINNIS, S. 1987 (OBS & MAP)

Dates Last Seen
Element: 2005-03-27
Site: 2005-03-27
Record Last Updated: 2006-03-22

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

* SENSITIVE *

Lat/Long:
UTM:
Radius:
Elevation:
Mapping Precision:
Symbol Type:
Township:
Range:
Section: **Qtr:**
Meridian:

Location: *SENSITIVE* Location information suppressed.

Location Detail: Please contact the Calfornia Natural Diversity Database, California Department of Fish and Game, for more information: (916) 324-3812.

Ecological: IN 1987, SITE WAS MOIST WITH GOOD GROUND COVER AND AN ABUNDANT SUPPLY OF PREY SPECIES (EARTHWORMS, SLENDER SALAMANDERS). HORSE STABLE POND IS A COASTAL WETLAND WITH SANDY SOILS, VEGETATED BY JUMAE, RUSH, SALTGRASS, AND CATTAILS.

Threat: THREATENED BY DOG ACTIVITY, GOLF COURSE MANAGEMENT ACTIVITIES, AND HABITAT DEGRADATION.

Owner/Manager:

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* SENSITIVE *

Occurrence No. 27 **Map Index:** 08906 **EO Index:** 27512

Occ Rank: Good
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: MCGINNIS, S. 1987 (OBS & MAP)

Dates Last Seen
Element: 1987-05-18
Site: 1987-05-18
Record Last Updated: 1996-01-11

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

* SENSITIVE *

Lat/Long:
UTM:
Radius:
Elevation:
Mapping Precision:
Symbol Type:
Township:
Range:
Section: **Qtr:**
Meridian:

Location: *SENSITIVE* Location information suppressed.

Location Detail: Please contact the Calfornia Natural Diversity Database, California Department of Fish and Game, for more information: (916) 324-3812.

Ecological: MARSHY CREEK AREA WHICH RECEIVES ITS WATER FROM SAN ANDREAS LAKE AND FLOWS INTO LOWER CRYSTAL SPRINGS RESERVOIR; DENSE RIPARIAN COVER PRESENT. PREY SPECIES PRESENT INCLUDE PACIFIC TREE FROG; NO RED-LEGGED FROGS OBSERVED.

Owner/Manager:

Thamnophis sirtalis tetrataenia

San Francisco garter snake

Element Code: ARADB3613B

Status
Federal: Endangered
State: Endangered

NDDB Element Ranks
Global: G5T2
State: S2

Other Lists
CDFG Status:

Habitat Associations
General: VICINITY OF FRESHWATER MARSHES, PONDS AND SLOW MOVING STREAMS IN SAN MATEO COUNTY AND EXTREME NORTHERN SANTA CRUZ COUNTY
Micro: PREFERS DENSE COVER & WATER DEPTHS OF AT LEAST ONE FOOT. UPLAND AREAS NEAR WATER ARE ALSO VERY IMPORTANT.

Occurrence No. 28 **Map Index:** 08826 **EO Index:** 27497
* SENSITIVE *
Occ Rank: Excellent
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: MCGINNIS, S. 1987 (OBS & MAP)

Dates Last Seen
Element: 1985-05-10
Site: 1985-05-10
Record Last Updated: 2006-03-21

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

* SENSITIVE *
Lat/Long:
UTM:
Radius:
Elevation:
Mapping Precision:
Symbol Type:
Township:
Range:
Section: **Qtr:**
Meridian:

Location: *SENSITIVE* Location information suppressed.
Location Detail: Please contact the Calfornia Natural Diversity Database, California Department of Fish and Game, for more information: (916) 324-3812.
Ecological: SMALL POND-TYPE RESERVOIR, MEASURING 150 BY 75 FEET, WITH GOOD SHORELINE COVER. OAK, BAY AND PINE WOODLAND, AND RIPARIAN. PREY SPECIES PRESENT INCLUDE PACIFIC TREE FROG AND RED-LEGGED FROG.
Threat: DETERIORATION OF MUD DAM COULD RESULT IN POND DRYING, POSSIBLY ELIMINATING POPULATION.
Owner/Manager:

Occurrence No. 34 **Map Index:** 54752 **EO Index:** 54752
* SENSITIVE *
Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: SWAIM, K. 2003 (OBS)

Dates Last Seen
Element: 2003-09-XX
Site: 2003-09-XX
Record Last Updated: 2004-03-22

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

* SENSITIVE *
Lat/Long:
UTM:
Radius:
Elevation:
Mapping Precision:
Symbol Type:
Township:
Range:
Section: **Qtr:**
Meridian:

Location: *SENSITIVE* Location information suppressed.
Location Detail: Please contact the Calfornia Natural Diversity Database, California Department of Fish and Game, for more information: (916) 324-3812.
Ecological: HABITAT CONSISTS OF UPLAND GRASSLAND/SHRUB WITH SEASONAL WETLANDS AND MAN-MADE CANALS. SITE IS SURROUNDED BY AN AIRPORT, BUSINESSES, AND RESIDENTIAL.
Owner/Manager:

Occurrence No. 39 **Map Index:** 64360 **EO Index:** 64439
* SENSITIVE *
Occ Rank: Fair
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: THOMAS, D. (OBS)

Dates Last Seen
Element: 2005-05-11
Site: 2005-05-11
Record Last Updated: 2006-03-28

Quad Summary: WOODSIDE (3712243/429A)
County Summary: SAN MATEO

* SENSITIVE *
Lat/Long:
UTM:
Radius:
Elevation:
Mapping Precision:
Symbol Type:
Township:
Range:
Section: **Qtr:**
Meridian:

Location: *SENSITIVE* Location information suppressed.
Location Detail: Please contact the Calfornia Natural Diversity Database, California Department of Fish and Game, for more information: (916) 324-3812.
Ecological: HABITAT CONSISTS OF A MIXTURE OF GRASSLAND, COASTAL SCRUB, AND WETLAND. DOMINANT PLANT SPECIES INCLUDE PHABIRIS AQUATICA, VICIA SATIVA, LOTUS SCOPARIUS, DIPSACUS SATIVUS, AVENA BARBATA, AND BRIZA MAXIMA.
Threat: THREATENED BY VEHICULAR TRAFFIC.
Owner/Manager:

Trifolium depauperatum var. hydrophilum

saline clover

Element Code: PDFAB400R5

Status
Federal: None
State: None

NDDB Element Ranks
Global: G5T2?
State: S2.2?

Other Lists
CNPS List: 1B
R-E-D Code: 3-2-3

Habitat Associations
General: MARSHES AND SWAMPS, VALLEY AND FOOTHILL GRASSLAND, VERNAL POOLS.
Micro: MESIC, ALKALINE SITES. 0-300M.

Occurrence No. 8 **Map Index:** 09246 **EO Index:** 49393
Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: GREENE, E. SN NDG (HERB)

Dates Last Seen
Element: 1886-05-09
Site: 1886-05-09

Record Last Updated: 2002-11-14

Quad Summary: REDWOOD POINT (3712252/447C), SAN MATEO (3712253/448D)
County Summary: SAN MATEO

Lat/Long: 37.54215° / -122.25192°
UTM: Zone-10 N4155280 E566085
Radius: 1 mile
Elevation: 10 ft
Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT
Township: 04S
Range: 04W
Section: 36 **Qtr:** XX
Meridian: M

Location: BELMONT.

General: TYPE LOCALITY. ONLY SOURCE OF INFORMATION IS COLLECTION FROM 1886 BY E. GREENE.

Owner/Manager: UNKNOWN

Triphysaria floribunda

San Francisco owl's-clover

Element Code: PDSCR2T010

Status		NDDB Element Ranks		Other Lists	
Federal:	None	**Global:**	G2	**CNPS List:**	1B
State:	None	**State:**	S2.2	**R-E-D Code:**	2-2-3

Habitat Associations

General: COASTAL PRAIRIE, VALLEY AND FOOTHILL GRASSLAND.

Micro: ON SERPENTINE AND NONSERPENTINE SUBSTRATE (SUCH AS AT PT. REYES). 10-160M.

Occurrence No. 16 **Map Index:** 45075 **EO Index:** 45075

Occ Rank: Unknown
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: BAKER, C. #1926 UNK HERB (HERB)

Dates Last Seen
Element: 1903-04-08
Site: 1991-XX-XX

Record Last Updated: 2001-03-09

Quad Summary: MONTARA MOUNTAIN (3712254/448C)

County Summary: SAN MATEO

Lat/Long: 37.59064° / -122.41007°
UTM: Zone-10 N4160561 E552080
Radius: 1 mile
Elevation:

Mapping PrecisionNON-SPECIFIC
Symbol Type:POINT

Township: 04S
Range: 05W
Section: 16 **Qtr:** XX
Meridian: M

Location: SAN ANDREAS LAKE, WEST OF MILLBRAE AND BURLINGAME.

Location Detail: MAPPED BY CNDDB AS BEST GUESS ON WESTERN SIDE OF SOUTH HALF OF SAN ANDREAS LAKE, WEST OF MILLBRAE AND BURLINGAME.

General: SITE BASED ON 1895 COLLECTION BY DAVY FROM MILLBRAE AND 1903 COLLECTION BY BAKER FROM SAN ANDREAS LAKE. WEST SIDE OF SAN ANDREAS LAKE SEARCHED IN 1991, PLANTS NOT FOUND. HABITAT MAY STILL EXIST.

Owner/Manager: UNKNOWN

Valley Needlegrass Grassland

Element Code: CTT42110CA

Status
Federal: None
State: None

NDDB Element Ranks
Global: G1
State: S3.1

Other Lists

Habitat Associations
General:
Micro:

Occurrence No. 50 **Map Index:** 21059 **EO Index:** 9155

Occ Rank: Excellent
Origin: Natural/Native occurrence
Presence: Presumed Extant
Trend: Unknown
Main Source: CORELLI, T. 1991 (OBS)

Dates Last Seen
Element: 1991-07-29
Site: 1991-07-29

Record Last Updated: 1998-07-15

Quad Summary: MONTARA MOUNTAIN (3712254/448C)
County Summary: SAN MATEO

Lat/Long: 37.57307° / -122.42164°
UTM: Zone-10 N4158605 E551071
Area: 199.2 ac
Elevation: 1,000 ft
Mapping PrecisionSPECIFIC
Symbol Type:POLYGON
Township: 04S
Range: 05W
Section: 21 **Qtr:** XX
Meridian: M

Location: ON SAWYER RIDGE FROM NE CORNER OF SECTION 20 DOWN TO THE PENINSULA OF LOWER CRYSTAL SPRINGS RESERVOIR.

Location Detail:ISLANDS OF GRASSLAND RUNNING FOR 2 MILES ALONG RIDGELINE. MANAGED BY SAN FRANCISCO WATER DEPARTMENT.

Ecological: DOMINANT GRASSES INCLUDE NASSELLA PULCHRA, FESTUCA IDAHOENSIS, ELYMUS GLACUS, AND BROMUS CALIFORNICUS. ALSO INCLUDES AVENA FATUA, BROMUS HORDEACEUS, BRACHYPODIUM DISTACHYON, CIRSIUM QUERCETORUM, VULPIA MYUROS, PERIDERIDIA KELLOGGII, OTHERS.

Threat: NONE, CLOSED TO PUBLIC.

General: THIS WAS OCC #050 OF CTT42110CA.

Owner/Manager: SFO CITY/COUNTY(MGMT BY SFPUC)

Appendix C

United States Fish and Wildlife Service Species Lists for the Project Quadrangles

Federal Endangered and Threatened Species that Occur in or may be Affected by Projects in the Counties and/or U.S.G.S. 7 1/2 Minute Quads you requested

Document Number: 061027015240

Database Last Updated: October 27, 2006

Species of Concern - The Sacramento Fish and Wildlife Office no longer maintains a list of species of concern. However, various other agencies and organizations maintain lists of at-risk species. These lists provide essential information for land management planning and conservation efforts. See www.fws.gov/sacramento/es/spp_concern.htm for more information and links to these sensitive species lists.

Red-Legged Frog Critical Habitat - The Service has designated final critical habitat for the California red-legged frog. The designation became final on May 15, 2006. See our map index.

Species

Listed Species

Invertebrates

Euphydryas editha bayensis
bay checkerspot butterfly (T)
Critical habitat, bay checkerspot butterfly (X)

Haliotes sorenseni
white abalone (E) (NMFS)

Icaricia icarioides missionensis
mission blue butterfly (E)

Incisalia mossii bayensis
San Bruno elfin butterfly (E)

Speyeria zerene myrtleae
Myrtle's silverspot butterfly (E)

Fish

Eucyclogobius newberryi
tidewater goby (E)

Hypomesus transpacificus
delta smelt (T)

Oncorhynchus kisutch
coho salmon - central CA coast (E) (NMFS)

Oncorhynchus mykiss
Central California Coastal steelhead (T) (NMFS)
Central Valley steelhead (T) (NMFS)
Critical habitat, Central California coastal steelhead (X) (NMFS)

Oncorhynchus tshawytscha
Central Valley spring-run chinook salmon (T) (NMFS)
winter-run chinook salmon, Sacramento River (E) (NMFS)

Amphibians

Ambystoma californiense
California tiger salamander, central population (T)

Rana aurora draytonii
California red-legged frog (T)
Critical habitat, California red-legged frog (X)

Reptiles

Caretta caretta
loggerhead turtle (T) (NMFS)

Chelonia mydas (incl. agassizi)
green turtle (T) (NMFS)

Dermochelys coriacea
leatherback turtle (E) (NMFS)

Lepidochelys olivacea
olive (=Pacific) ridley sea turtle (T) (NMFS)

Thamnophis sirtalis tetrataenia
San Francisco garter snake (E)

Birds

Brachyramphus marmoratus
Critical habitat, marbled murrelet (X)
marbled murrelet (T)

Charadrius alexandrinus nivosus
western snowy plover (T)

Diomedea albatrus
short-tailed albatross (E)

Haliaeetus leucocephalus
bald eagle (T)

Pelecanus occidentalis californicus
California brown pelican (E)

Rallus longirostris obsoletus

California clapper rail (E)

Sternula antillarum (=Sterna, =albifrons) browni
California least tern (E)

Mammals

Arctocephalus townsendi
Guadalupe fur seal (T) (NMFS)

Balaenoptera borealis
sei whale (E) (NMFS)

Balaenoptera musculus
blue whale (E) (NMFS)

Balaenoptera physalus
finback (=fin) whale (E) (NMFS)

Eubalaena glacialis
right whale (E) (NMFS)

Eumetopias jubatus
Steller (=northern) sea-lion (T) (NMFS)

Physeter catodon (=macrocephalus)
sperm whale (E) (NMFS)

Reithrodontomys raviventris
salt marsh harvest mouse (E)

Plants

Acanthomintha duttonii
San Mateo thornmint (E)

Cirsium fontinale var. fontinale
fountain thistle (E)

Eriophyllum latilobum
San Mateo woolly sunflower (E)

Hesperolinon congestum
Marin dwarf-flax (=western flax) (T)

Pentachaeta bellidiflora
white-rayed pentachaeta (E)

Potentilla hickmanii
Hickman's potentilla (=cinquefoil) (E)

Candidate Species

Invertebrates

Haliotes cracherodii
black abalone (C) (NMFS)

Fish

Oncorhynchus tshawytscha
Central Valley fall/late fall-run chinook salmon (C) (NMFS)
Critical habitat, Central Valley fall/late fall-run chinook (C) (NMFS)

Selected Quads

WOODSIDE (429A) MONTARA MOUNTAIN (448C) SAN MATEO (448D)

County Lists

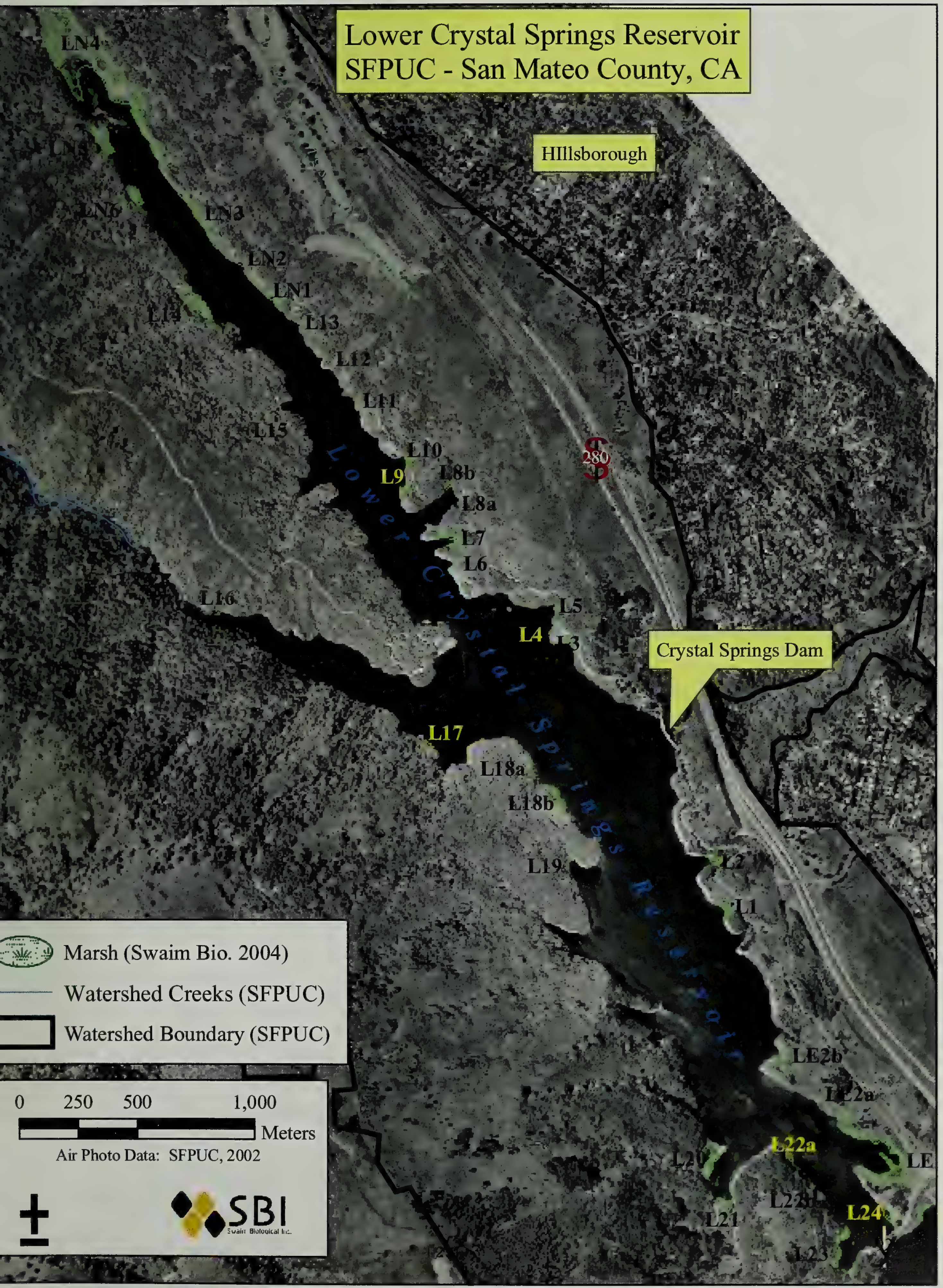
No county species lists requested.

Key:

- (E) Endangered - Listed as being in danger of extinction.
- (T) Threatened - Listed as likely to become endangered within the foreseeable future.
- (P) Proposed - Officially proposed in the Federal Register for listing as endangered or threatened.
- (NMFS) Species under the Jurisdiction of the National Oceanic and Atmospheric Administration Fisheries Service. Consult with them directly about these species.
- Critical Habitat - Area essential to the conservation of a species.
- (PX) Proposed Critical Habitat - The species is already listed. Critical habitat is being proposed for it.
- (C) Candidate - Candidate to become a proposed species.
- (V) Vacated by a court order. Not currently in effect. Being reviewed by the Service.
- (X) Critical Habitat designated for this species

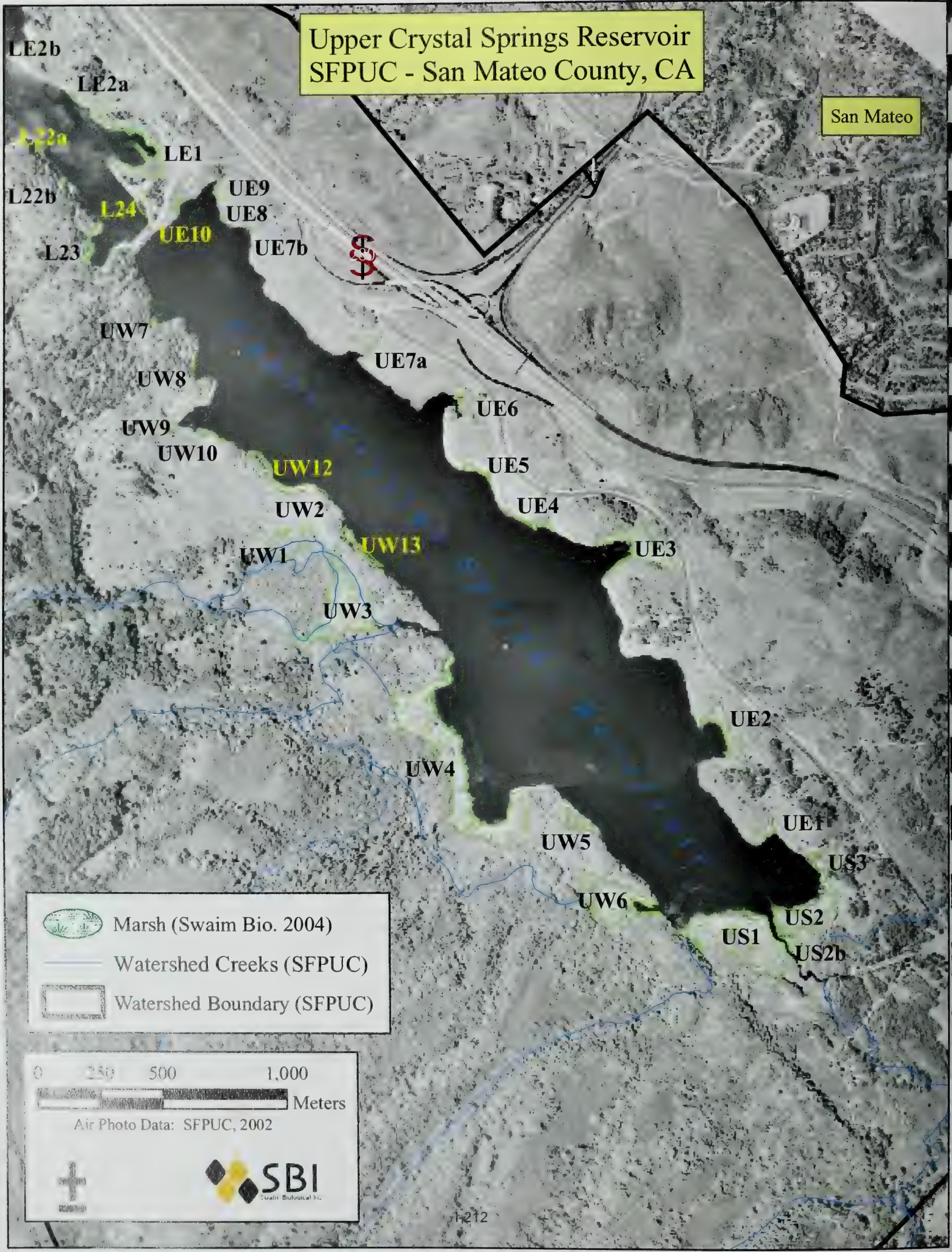
Appendix D This does not show the extent of the surveyed area.

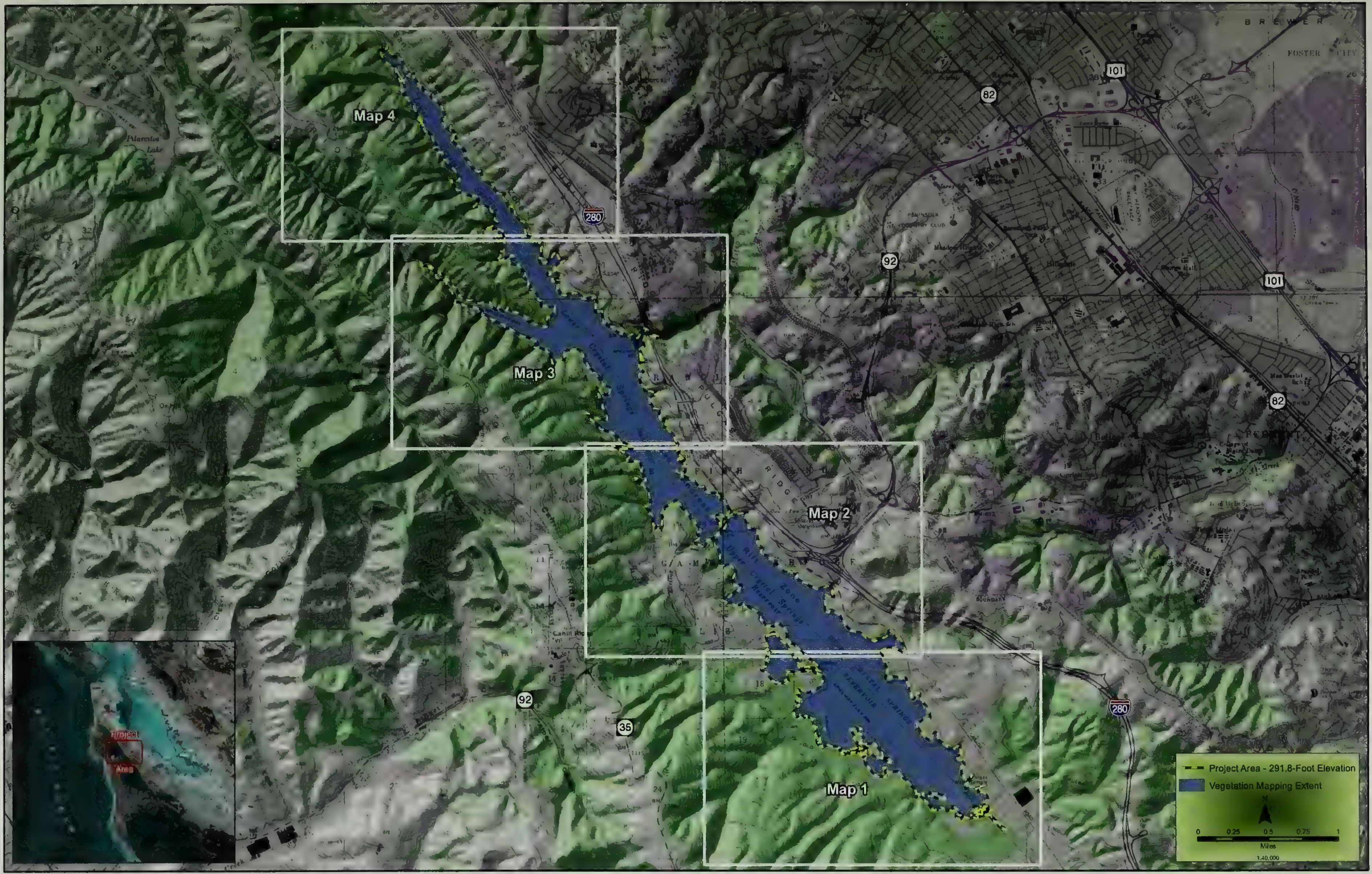
Survey Locations for California Red-legged Frog and San Francisco Garter Snake Study



Lower Crystal Springs Reservoir
SFPUC - San Mateo County, CA

Air Photo Data: SFPUC, 2002

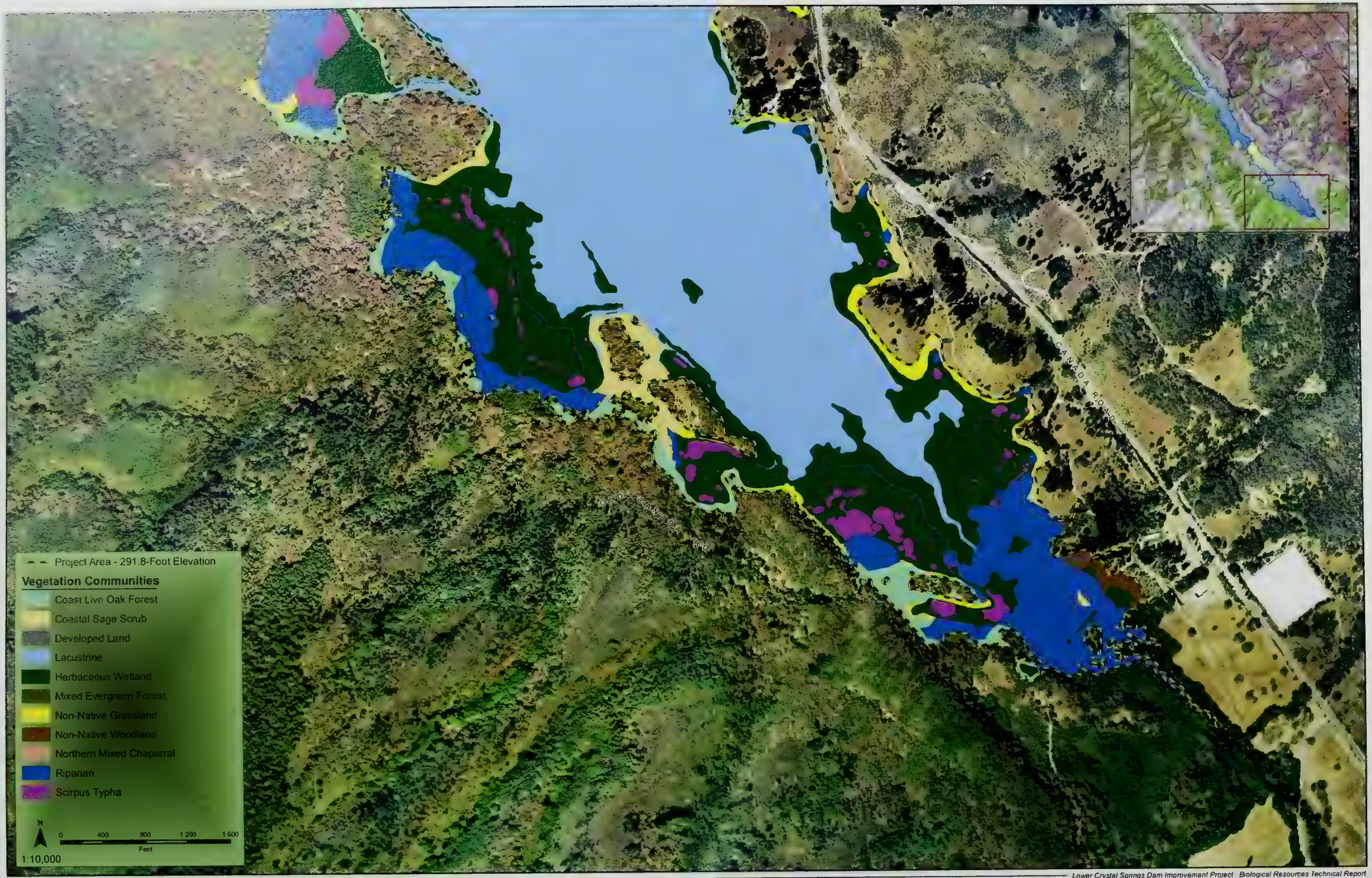

Upper Crystal Springs Reservoir
SFPUC - San Mateo County, CA
San Mateo
LE2b
LE2a
L22a
LE1
L22b
L24
UE10
UE9
UE8
L23
UE7b
UW7
UE7a
UW8
UE6
UW9
UW10
UW12
UE5
UW2
UE4
UW13
UW1
UE3
UW3
UE2
UW4
UE1
UW5
US3
UW6
US2
US1
US2b
Marsh (Swaim Bio. 2004)
Watershed Creeks (SFPUC)
Watershed Boundary (SFPUC)
0
250
500
1,000
Meters
Air Photo Data: SFPUC, 2002
SBI
Swaim Biological Inc.


Map 4
Map 3
Map 2
Map 1
280
92
101
82
35
Upper Crystal Springs Reservoir
Crystal Springs Reservoir
Project Area
Project Area - 291.8-Foot Elevation
Vegetation Mapping Extent
N
0
0.25
0.5
0.75
1
Miles
1:40,000

Lower Crystal Springs Dam Improvements Project

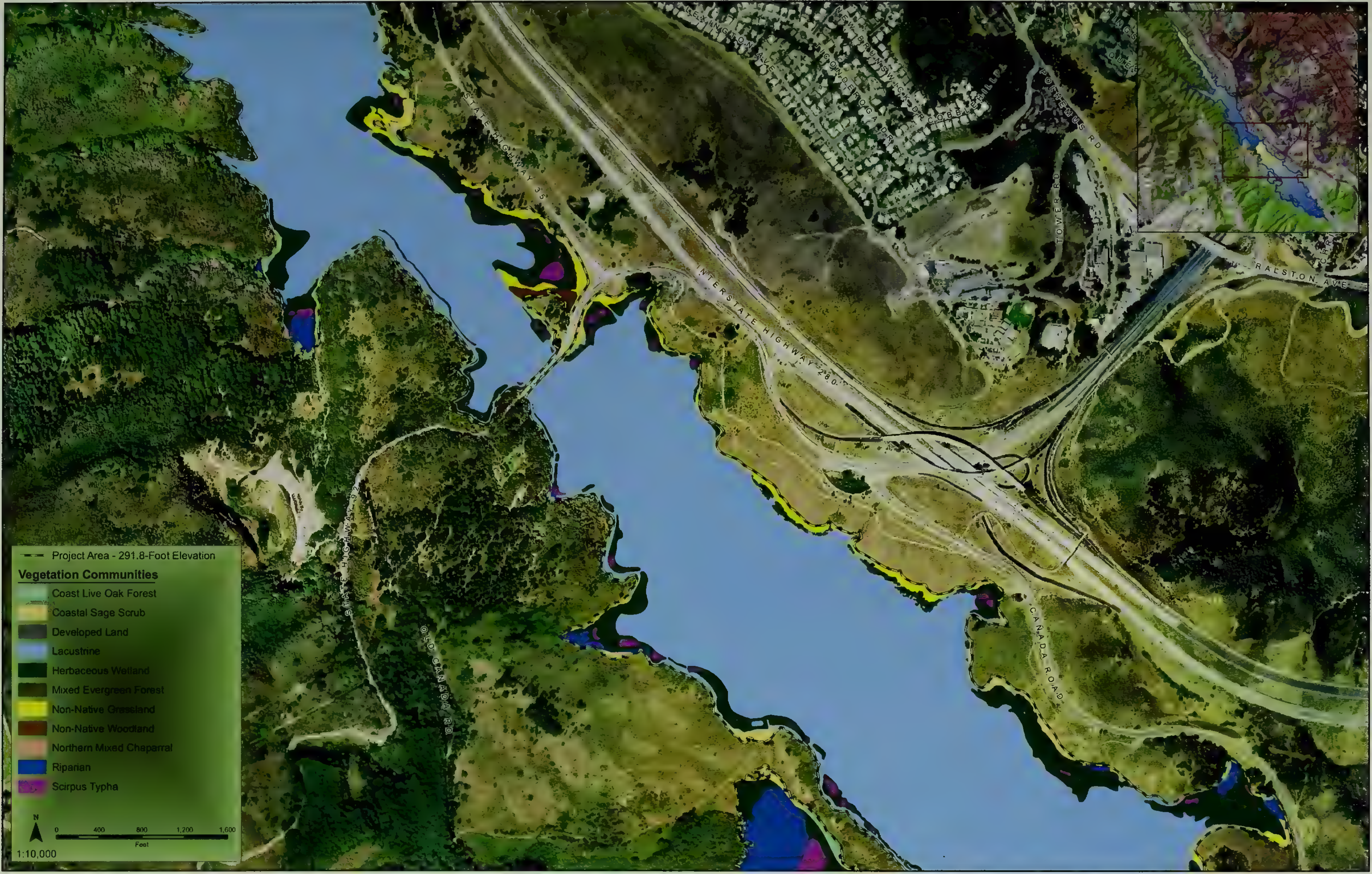
Appendix E : Index Map

Vegetation Communities



Appendix E : Map 1 of 4

Vegetation Communities



Lower Crystal Springs Dam Improvement Project Biological Resources Technical Report

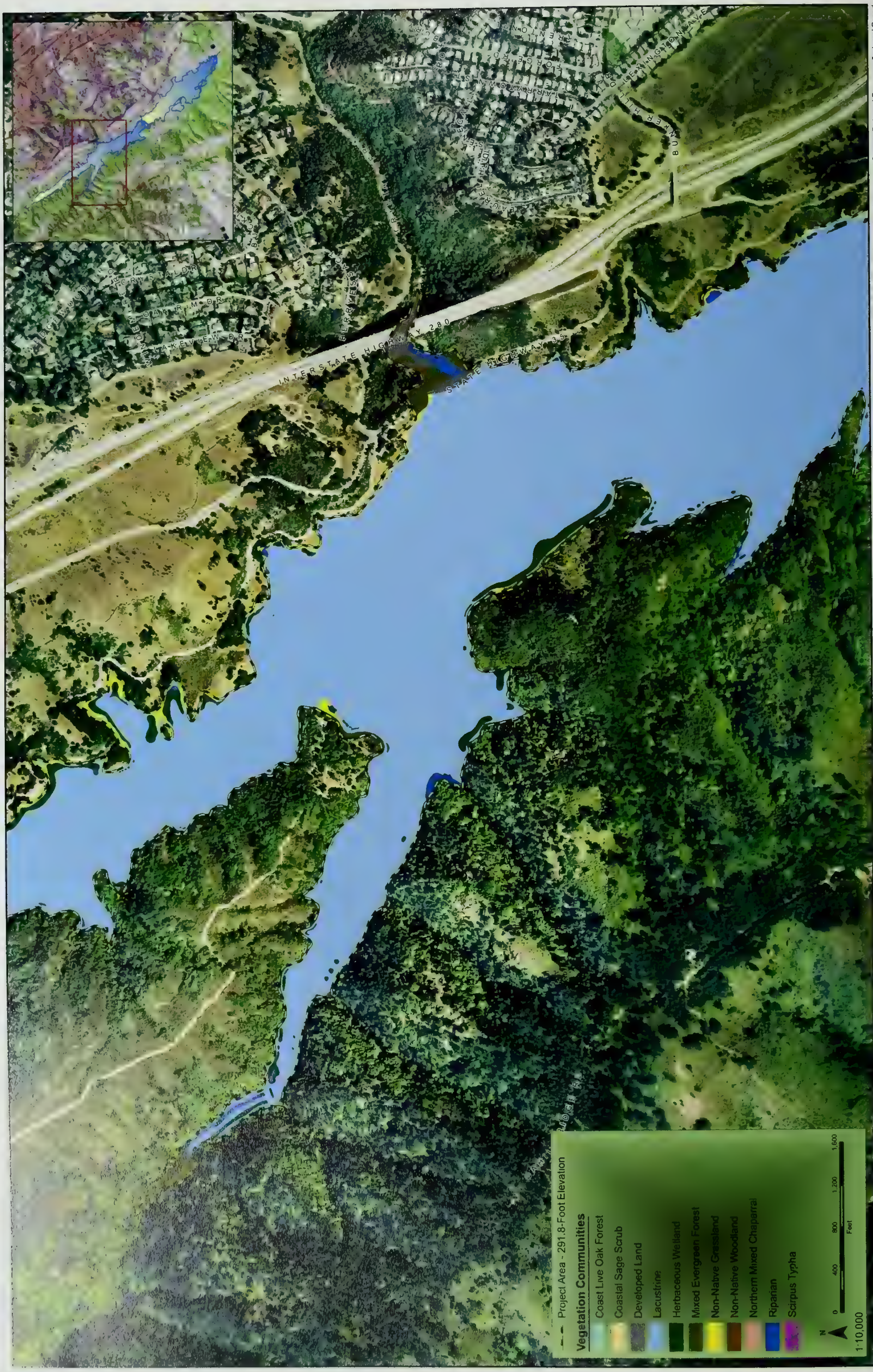
Appendix E : Map 2 of 4

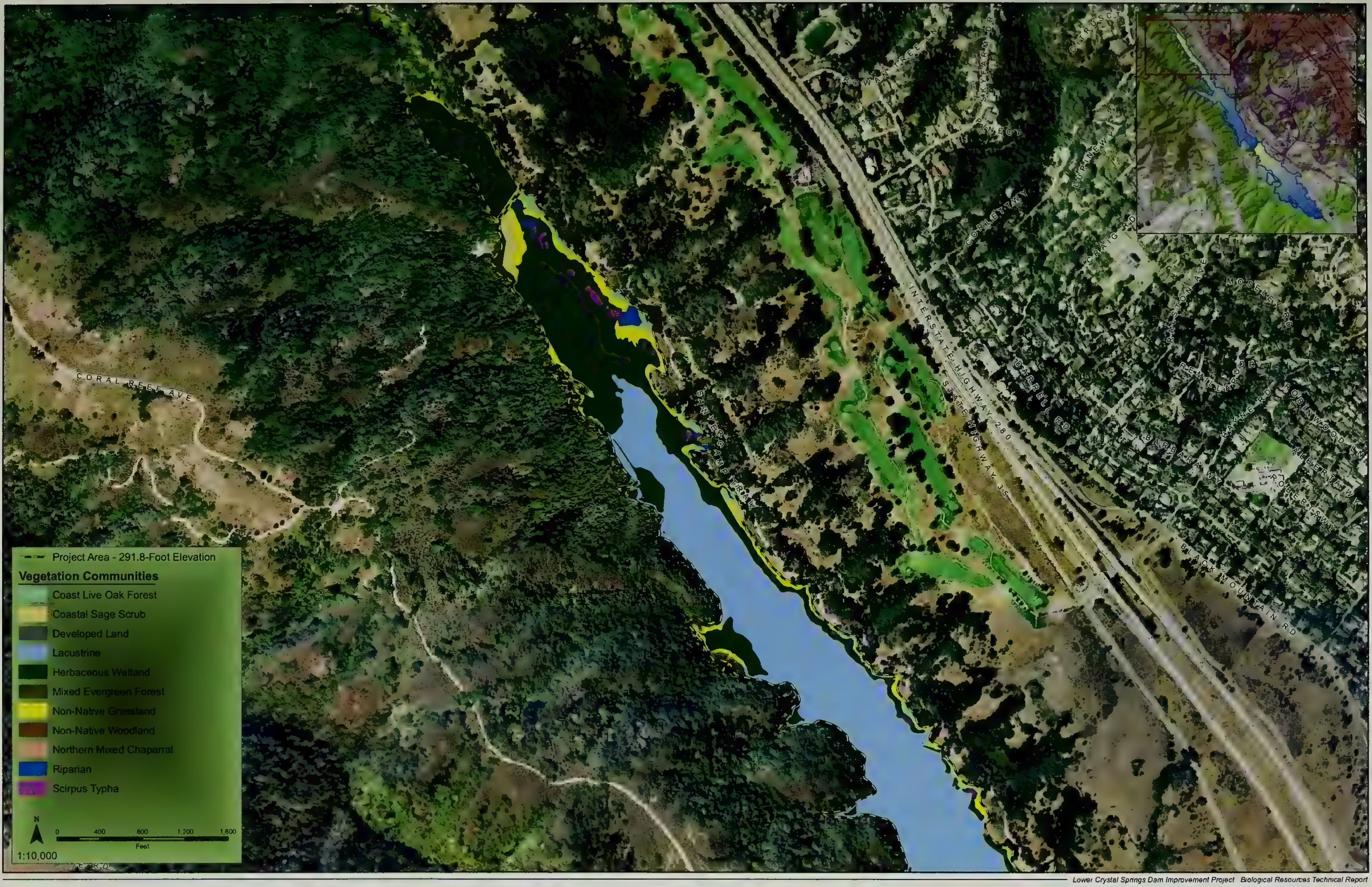
Vegetation Communities

Lower Crystal Springs Dam Improvement Project Biological Resources Technical Report

Appendix E : Map 3 of 4

Vegetation Communities





Appendix E : Map 4 of 4

Vegetation Communities

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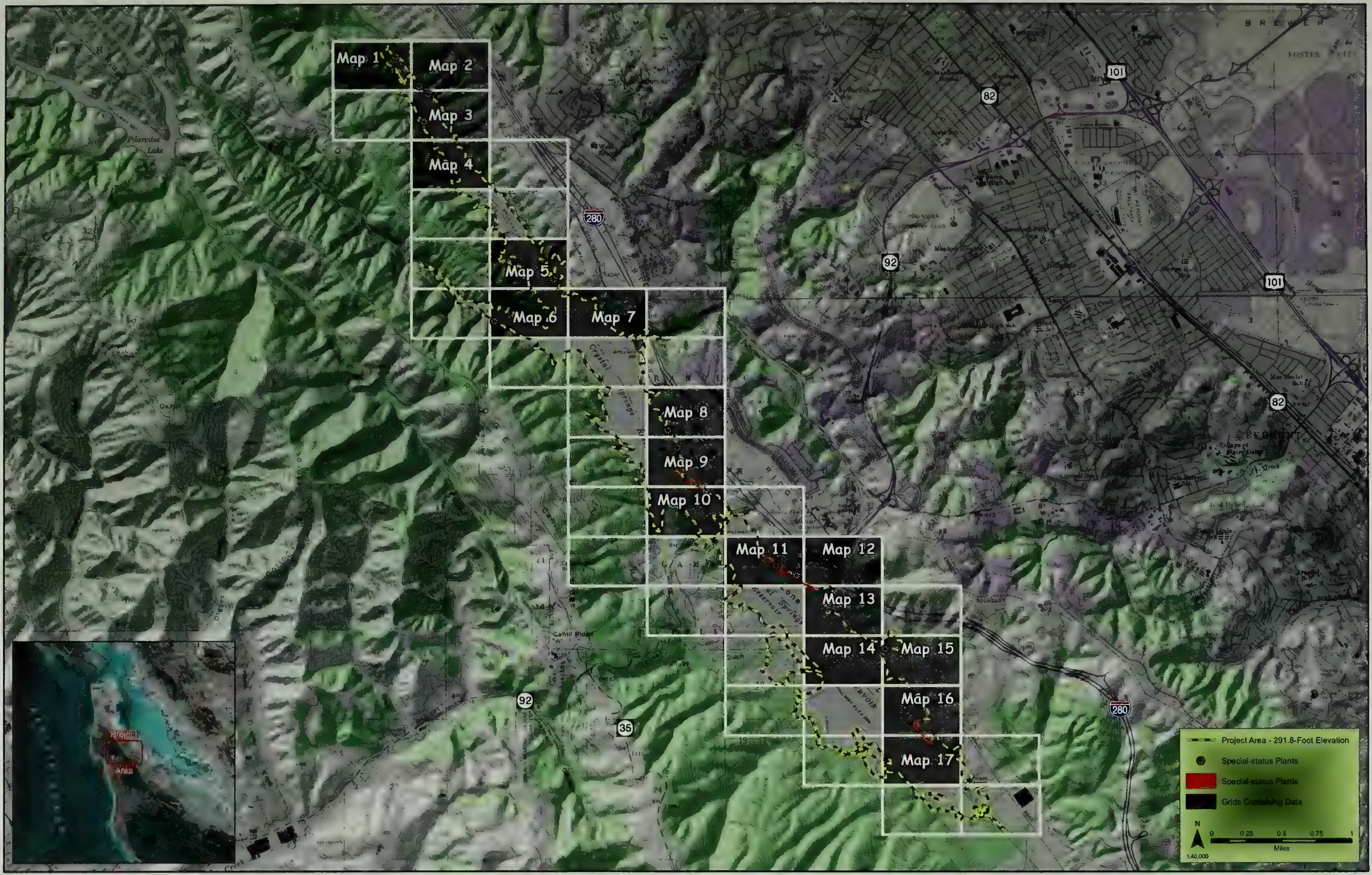
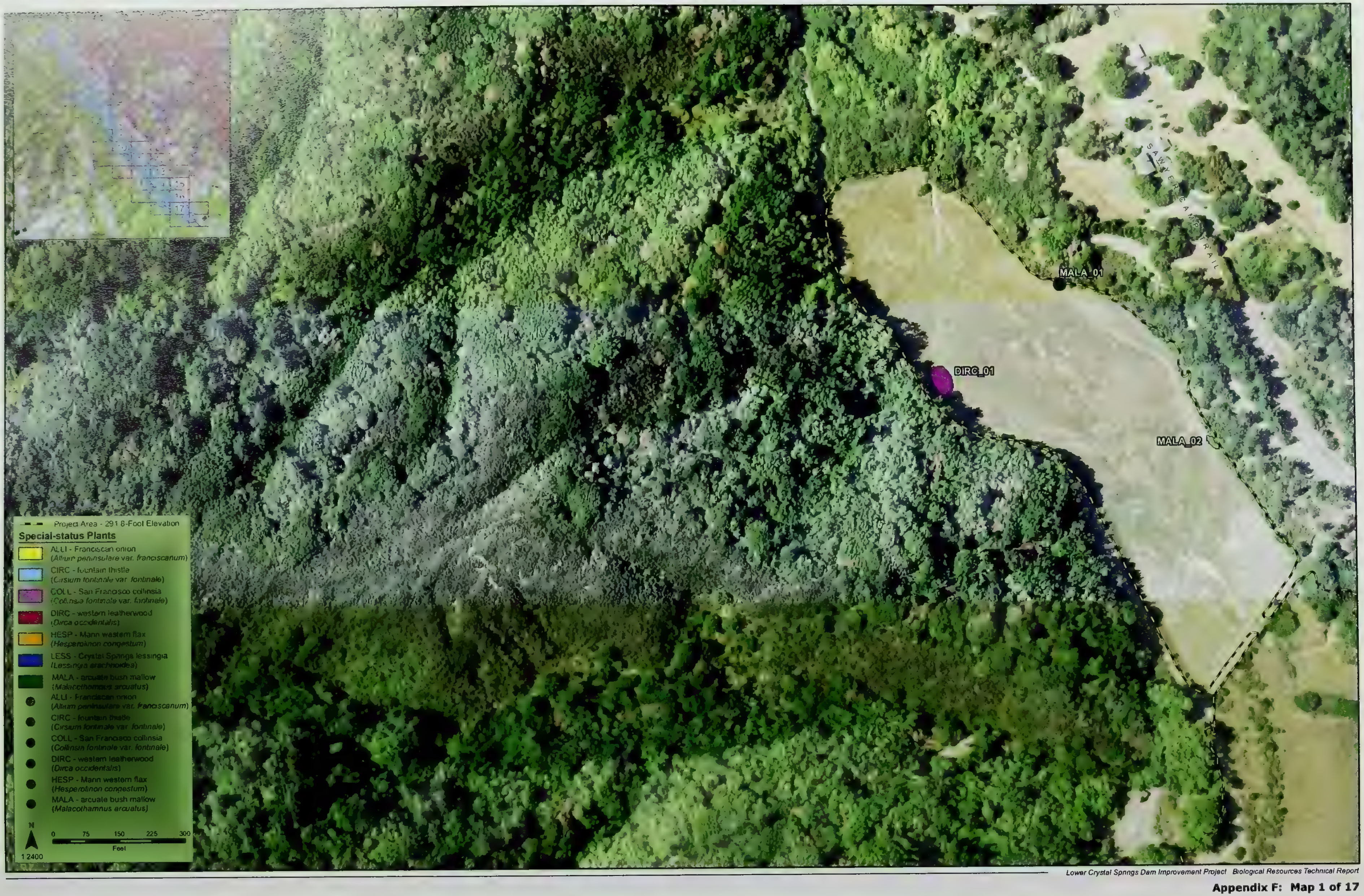


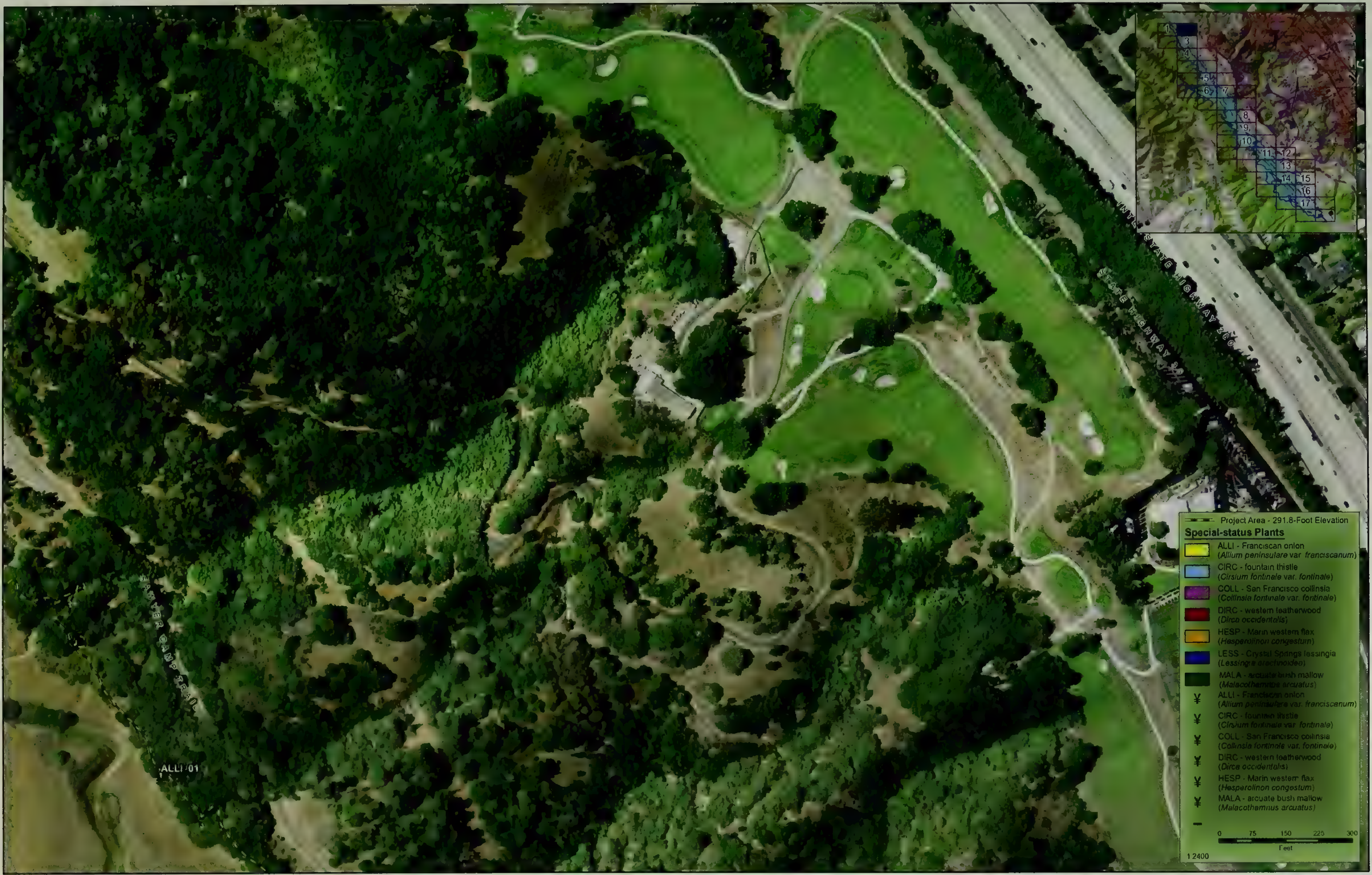
Appendix F : Index Map

Mapped Locations of Special-Status Plant Species


SAWYER CAMP TRAIL
MALA_01
DIRC_01
MALA_02
Project Area - 291.8-Foot Elevation
Special-status Plants
ALLI - Franciscan onion
(Allium peninsulare var. franciscanum)
CIRC - fountain thistle
(Cirsium fontinale var. fontinale)
COLL - San Francisco collinsia
(Collinsia fontinale var. fontinale)
DIRC - western leatherwood
(Dirca occidentalis)
HESP - Marin western flax
(Hesperolinon congestum)
LESS - Crystal Springs lessingia
(Lessingia arachnoidea)
MALA - arcuate bush mallow
(Malacothamnus arcuatus)
ALLI - Franciscan onion
(Allium peninsulare var. franciscanum)
CIRC - fountain thistle
(Cirsium fontinale var. fontinale)
COLL - San Francisco collinsia
(Collinsia fontinale var. fontinale)
DIRC - western leatherwood
(Dirca occidentalis)
HESP - Marin western flax
(Hesperolinon congestum)
MALA - arcuate bush mallow
(Malacothamnus arcuatus)
N
0
75
150
225
300
Feet
1:2400

Appendix F: Map 1 of 17

Mapped Locations of Special-Status Plant Species


INTERSTATE HIGHWAY 280
STATE HIGHWAY 92
SAWYER CAMP TRAIL
ALLI 01
1
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
Project Area - 291.8-Foot Elevation
Special-status Plants
ALLI - Franciscan onion (Allium peninsulare var. franciscanum)
CIRC - fountain thistle (Cirsium fontinale var. fontinale)
COLL - San Francisco collinsia (Collinsia fontinale var. fontinale)
DIRC - western leatherwood (Dirca occidentalis)
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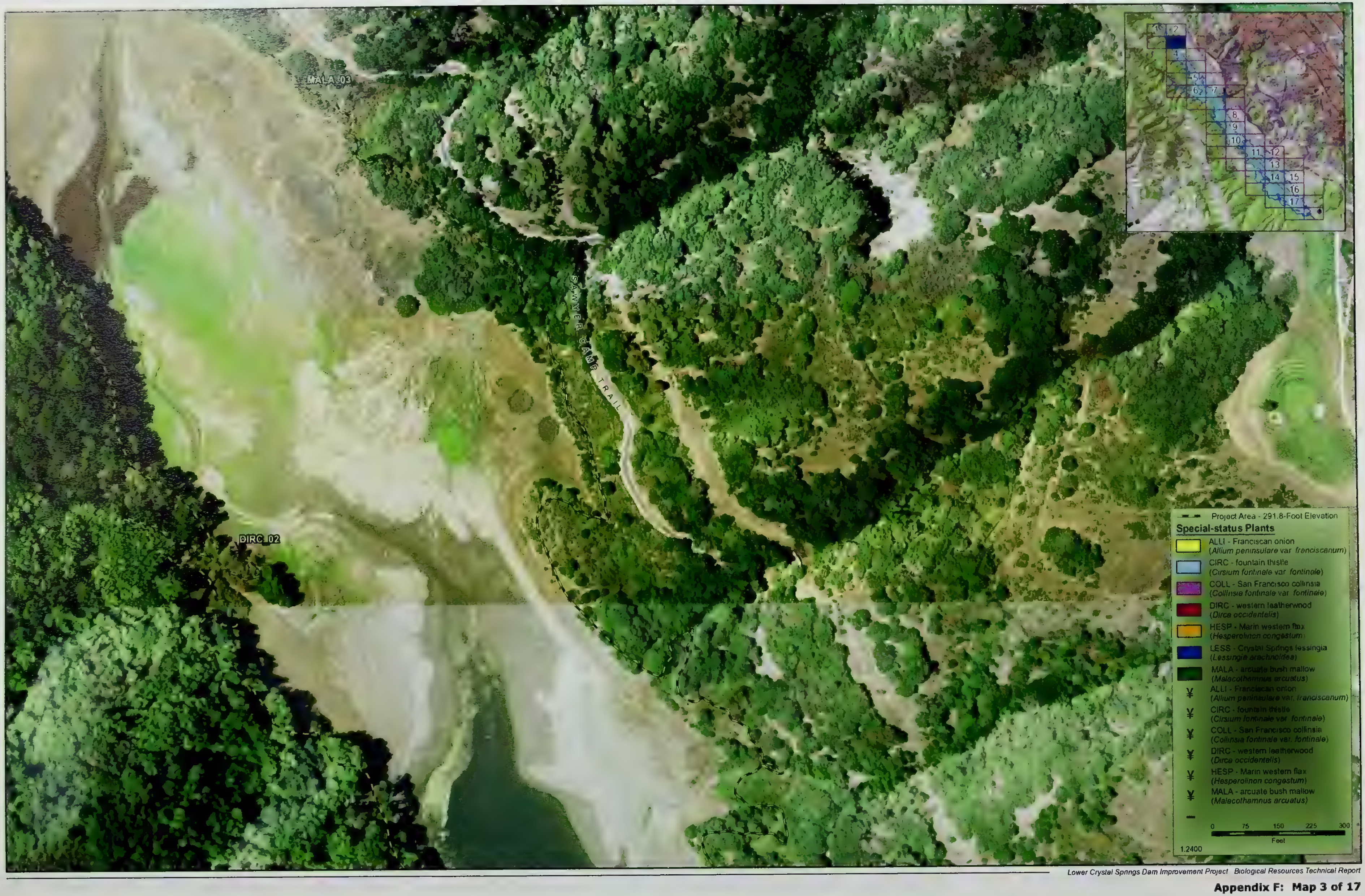
COLL - San Francisco collinsia (Collinsia fontinale var. fontinale)
DIRC - western leatherwood (Dirca occidentalis)
HESP - Marin western flax (Hesperolinon congestum)
MALA - arcuate bush mallow (Malacothamnus arcuatus)
0
75
150
225
300
Feet
1:2400

Lower Crystal Springs Dam Improvement Project   Biological Resources Technical Report

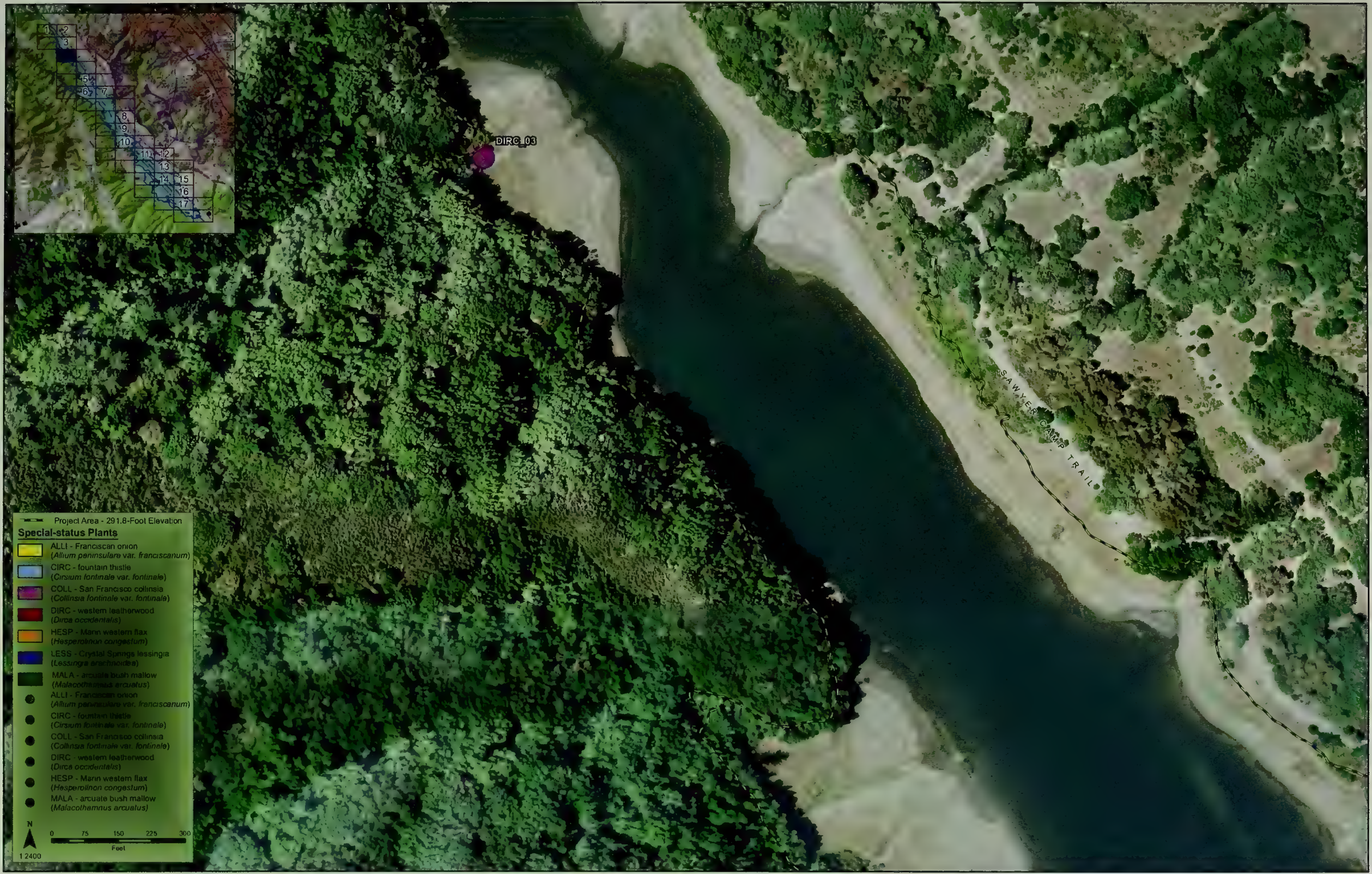
Appendix F: Map 2 of 17

Mapped Locations of Special-Status Plant Species


MALA_03
DIRC_02
SAWYER CAMP TRAIL
1
2
4
5
6
7
8
9
10
11
12
13
14
15
16
17
Project Area - 291.8-Foot Elevation
Special-status Plants
ALLI - Franciscan onion (Allium peninsulare var. franciscanum)
CIRC - fountain thistle (Cirsium fontinale var. fontinale)
COLL - San Francisco collinsia (Collinsia fontinale var. fontinale)
DIRC - western leatherwood (Dirca occidentalis)
HESP - Marin western flax (Hesperolinon congestum)
LESS - Crystal Springs lessingia (Lessingia arachnoidea)
MALA - arcuate bush mallow (Malacothamnus arcuatus)
ALLI - Franciscan onion (Allium peninsulare var. franciscanum)
CIRC - fountain thistle (Cirsium fontinale var. fontinale)
COLL - San Francisco collinsia (Collinsia fontinale var. fontinale)
DIRC - western leatherwood (Dirca occidentalis)
HESP - Marin western flax (Hesperolinon congestum)
MALA - arcuate bush mallow (Malacothamnus arcuatus)
0
75
150
225
300
Feet
1:2400

Appendix F: Map 3 of 17

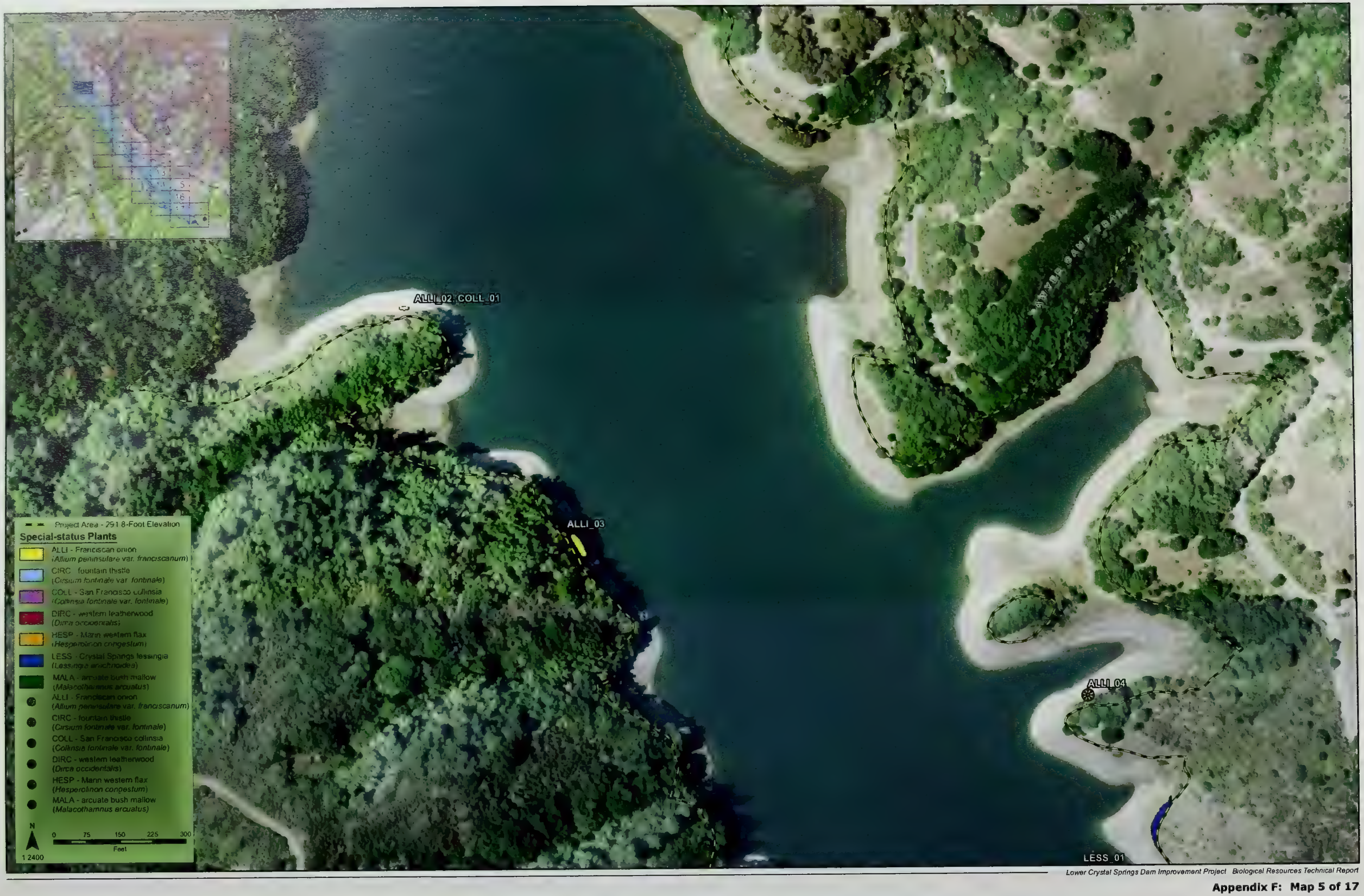
Mapped Locations of Special-Status Plant Species


DIRC_03
SAWYER CAMP TRAIL
1
2
3
5
6
7
8
9
10
11
12
13
14
15
16
17
Project Area - 291.8-Foot Elevation
Special-status Plants
ALLI - Franciscan onion (Allium peninsulare var. franciscanum)
CIRC - fountain thistle (Cirsium fontinale var. fontinale)
COLL - San Francisco collinsia (Collinsia fontinale var. fontinale)
DIRC - western leatherwood (Dirca occidentalis)
HESP - Marin western flax (Hesperolinon congestum)
LESS - Crystal Springs lessingia (Lessingia arachnoidea)
MALA - arcuate bush mallow (Malacothamnus arcuatus)
ALLI - Franciscan onion (Allium peninsulare var. franciscanum)
CIRC - fountain thistle (Cirsium fontinale var. fontinale)
COLL - San Francisco collinsia (Collinsia fontinale var. fontinale)
DIRC - western leatherwood (Dirca occidentalis)
HESP - Marin western flax (Hesperolinon congestum)
MALA - arcuate bush mallow (Malacothamnus arcuatus)
N
0
75
150
225
300
Feet
1:2400

Lower Crystal Springs Dam Improvement Project Biological Resources Technical Report

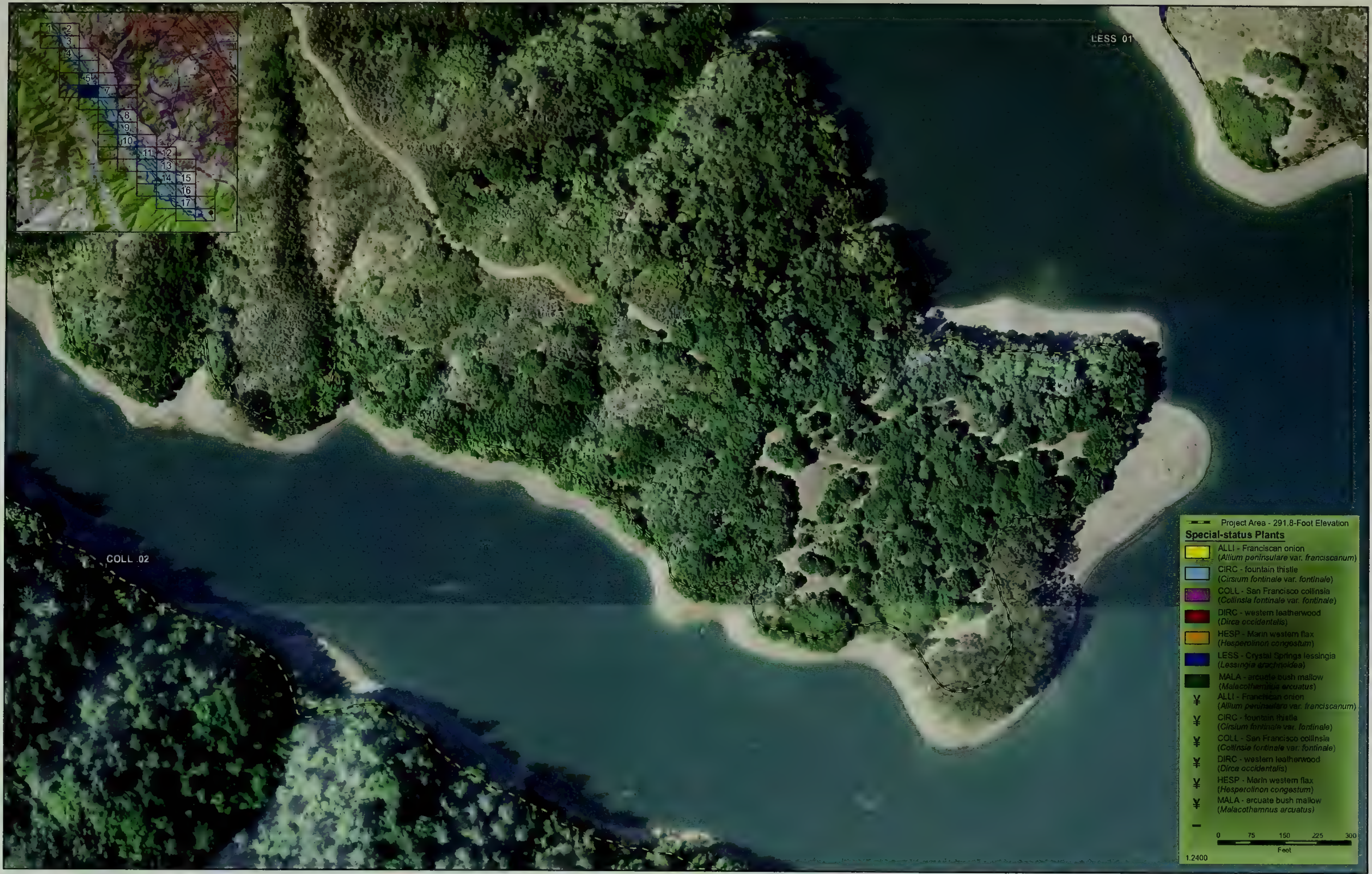
Appendix F: Map 4 of 17

Mapped Locations of Special-Status Plant Species


ALLI_02, COLL_01
ALLI_03
ALLI_04
LESS_01
SAWYER CAMP TRAIL
Project Area - 291.8-Foot Elevation
Special-status Plants
ALLI - Franciscan onion (*Allium peninsulare var. franciscanum*)
CIRC - fountain thistle (*Cirsium fontinale var. fontinale*)
COLL - San Francisco collinsia (*Collinsia fontinale var. fontinale*)
DIRC - western leatherwood (*Dirca occidentalis*)
HESP - Marin western flax (*Hesperolinon congestum*)
LESS - Crystal Springs lessingia (*Lessingia arachnoidea*)
MALA - arcuate bush mallow (*Malacothamnus arcuatus*)
ALLI - Franciscan onion (*Allium peninsulare var. franciscanum*)
CIRC - fountain thistle (*Cirsium fontinale var. fontinale*)
COLL - San Francisco collinsia (*Collinsia fontinale var. fontinale*)
DIRC - western leatherwood (*Dirca occidentalis*)
HESP - Marin western flax (*Hesperolinon congestum*)
MALA - arcuate bush mallow (*Malacothamnus arcuatus*)
N
1:2400
0
75
150
225
300
Feet
5
6

Appendix F: Map 5 of 17

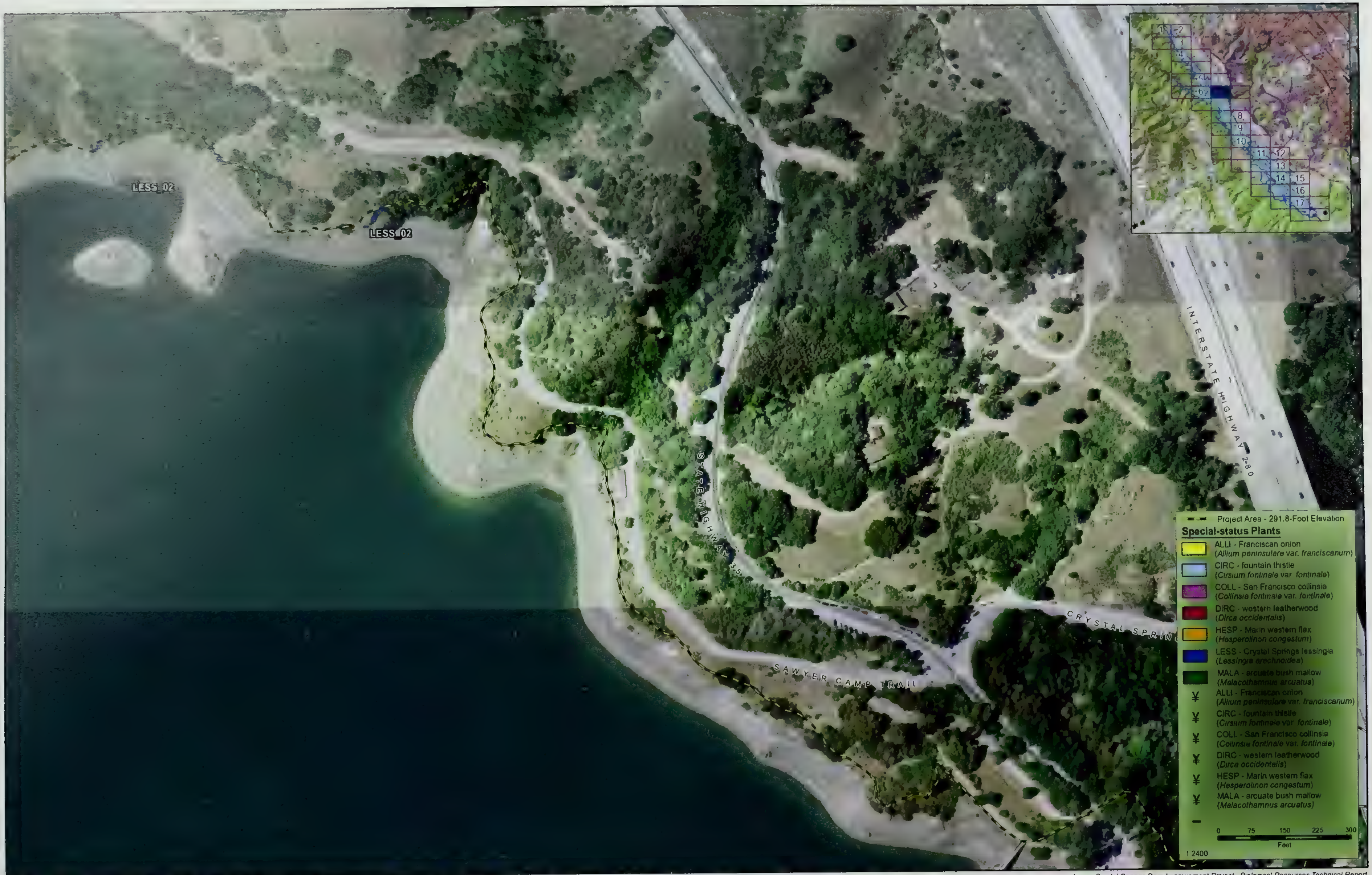
Mapped Locations of Special-Status Plant Species


LESS 01
COLL 02
1
2
3
4
5
7
8
9
10
11
12
13
14
15
16
17
Project Area - 291.8-Foot Elevation
Special-status Plants
ALLI - Franciscan onion (Allium peninsulare var. franciscanum)
CIRC - fountain thistle (Cirsium fontinale var. fontinale)
COLL - San Francisco collinsia (Collinsia fontinale var. fontinale)
DIRC - western leatherwood (Dirca occidentalis)
HESP - Marin western flax (Hesperolinon congestum)
LESS - Crystal Springs lessingia (Lessingia arachnoidea)
MALA - arcuate bush mallow (Malacothamnus arcuatus)
ALLI - Franciscan onion (Allium peninsulare var. franciscanum)
CIRC - fountain thistle (Cirsium fontinale var. fontinale)
COLL - San Francisco collinsia (Collinsia fontinale var. fontinale)
DIRC - western leatherwood (Dirca occidentalis)
HESP - Marin western flax (Hesperolinon congestum)
MALA - arcuate bush mallow (Malacothamnus arcuatus)
0
75
150
225
300
Feet
1:2400

Lower Crystal Springs Dam Improvement Project Biological Resources Technical Report

Appendix F: Map 6 of 17

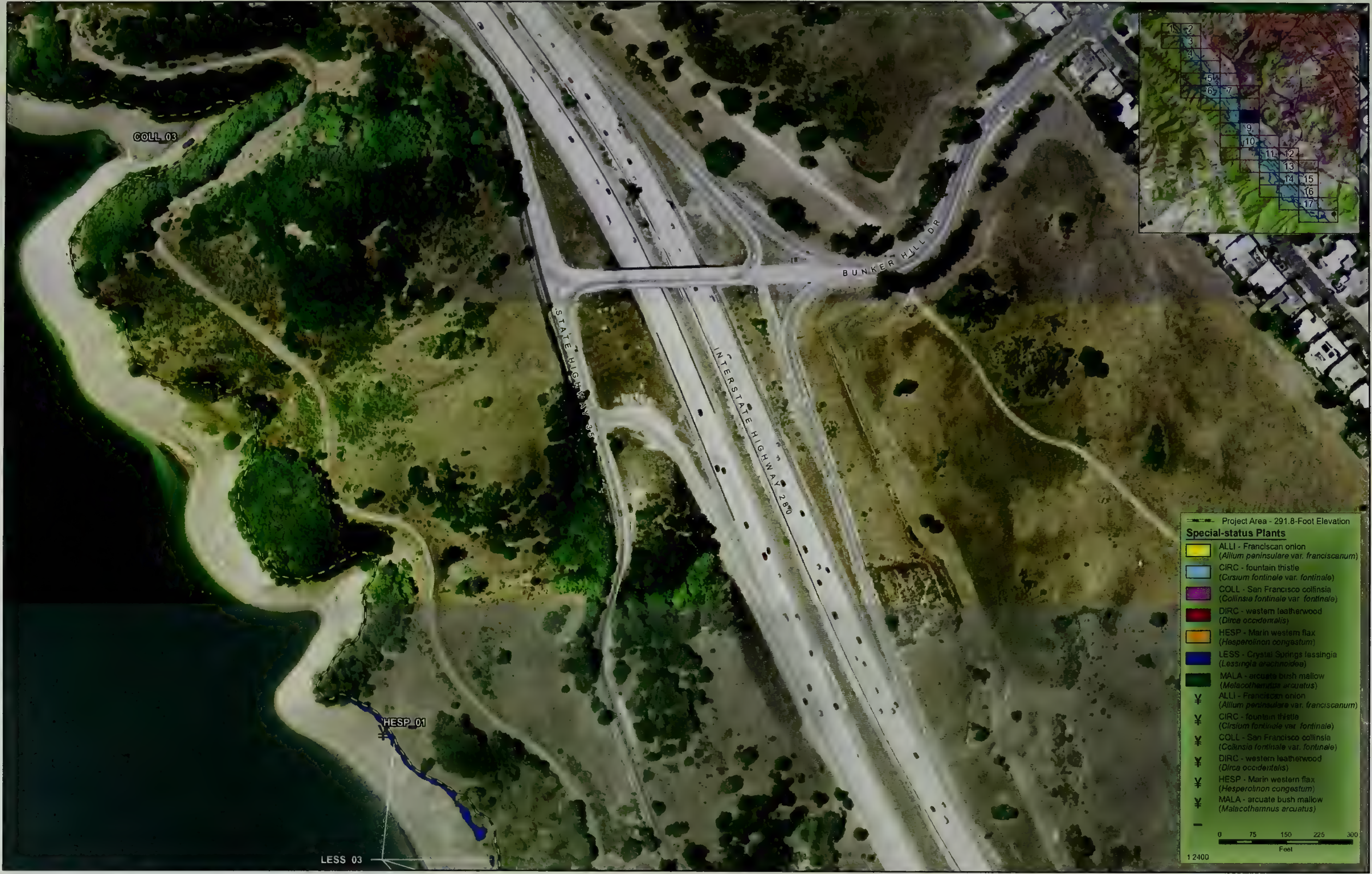
Mapped Locations of Special-Status Plant Species


LESS_02
LESS_02
INTERSTATE HIGHWAY 280
STATE HIGHWAY 35
CRYSTAL SPRING
SAWYER CAMP TRAIL
1
2
8
9
10
11
12
13
14
15
16
17
Project Area - 291.8-Foot Elevation
Special-status Plants
ALLI - Franciscan onion (Allium peninsulare var. franciscanum)
CIRC - fountain thistle (Cirsium fontinale var. fontinale)
COLL - San Francisco collinsia (Collinsia fontinale var. fontinale)
DIRC - western leatherwood (Dirca occidentalis)
HESP - Marin western flax (Hesperolinon congestum)
LESS - Crystal Springs lessingia (Lessingia arachnoidea)
MALA - arcuate bush mallow (Malacothamnus arcuatus)
ALLI - Franciscan onion (Allium peninsulare var. franciscanum)
CIRC - fountain thistle (Cirsium fontinale var. fontinale)
COLL - San Francisco collinsia (Collinsia fontinale var. fontinale)
DIRC - western leatherwood (Dirca occidentalis)
HESP - Marin western flax (Hesperolinon congestum)
MALA - arcuate bush mallow (Malacothamnus arcuatus)
0
75
150
225
300
Feet
1 2400

Lower Crystal Springs Dam Improvement Project Biological Resources Technical Report

Appendix F: Map 7 of 17

Mapped Locations of Special-Status Plant Species


COLL_03
HESP_01
LESS_03
STATE HIGHWAY 35
INTERSTATE HIGHWAY 280
BUNKER HILL DR
1
2
3
4
5
6
7
9
10
11
12
13
14
15
16
17
Project Area - 291.8-Foot Elevation
Special-status Plants
ALLI - Franciscan onion (Allium peninsulare var. franciscanum)
CIRC - fountain thistle (Cirsium fontinale var. fontinale)
COLL - San Francisco collinsia (Collinsia fontinale var. fontinale)
DIRC - western leatherwood (Dirca occidentalis)
HESP - Marin western flax (Hesperolinon congestum)
LESS - Crystal Springs lessingia (Lessingia arachnoidea)
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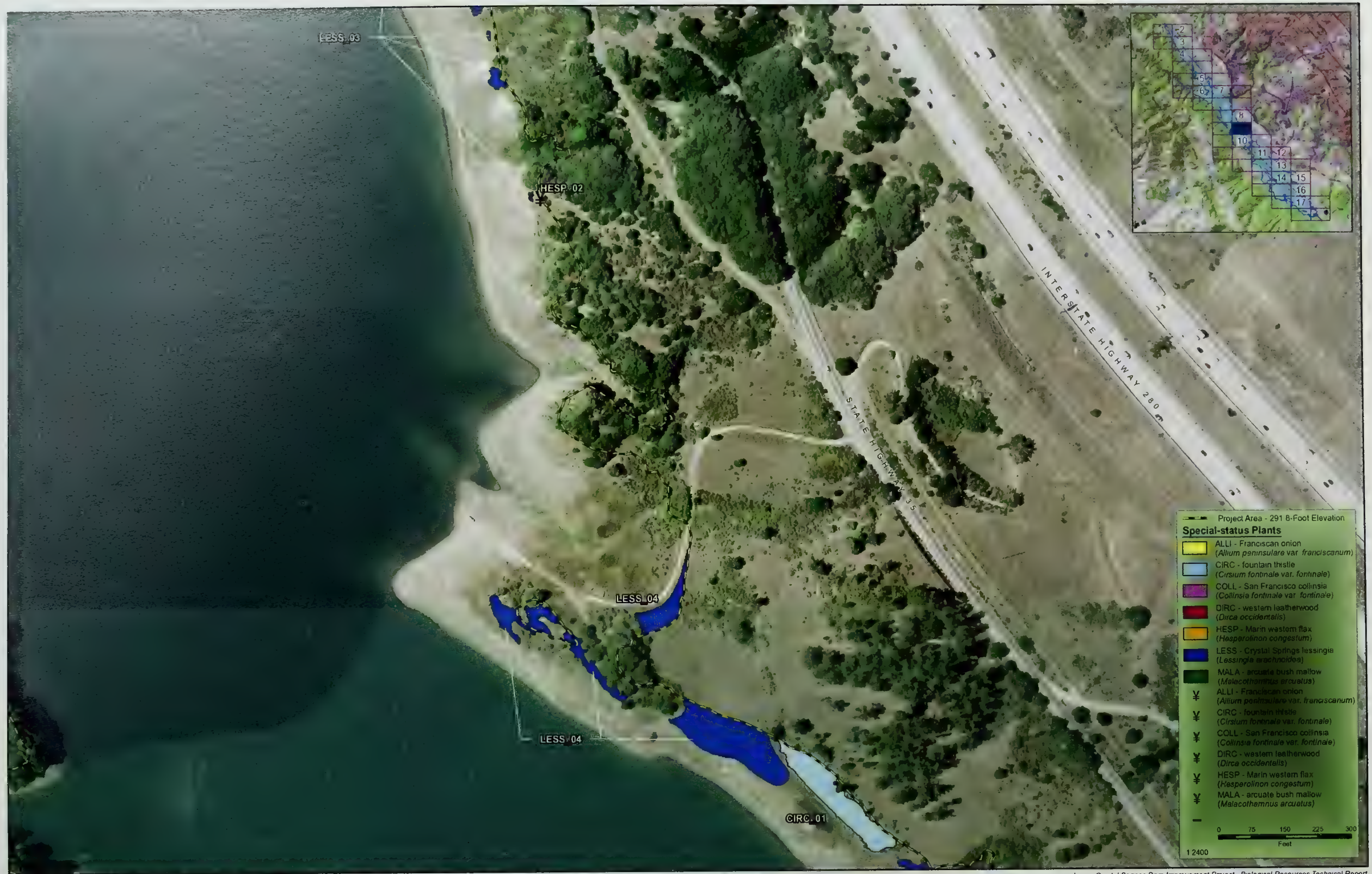
CIRC - fountain thistle (Cirsium fontinale var. fontinale)
COLL - San Francisco collinsia (Collinsia fontinale var. fontinale)
DIRC - western leatherwood (Dirca occidentalis)
HESP - Marin western flax (Hesperolinon congestum)
MALA - arcuate bush mallow (Malacothamnus arcuatus)
0
75
150
225
300
Feet
1:2400

Lower Crystal Springs Dam Improvement Project Biological Resources Technical Report

Appendix F: Map 8 of 17

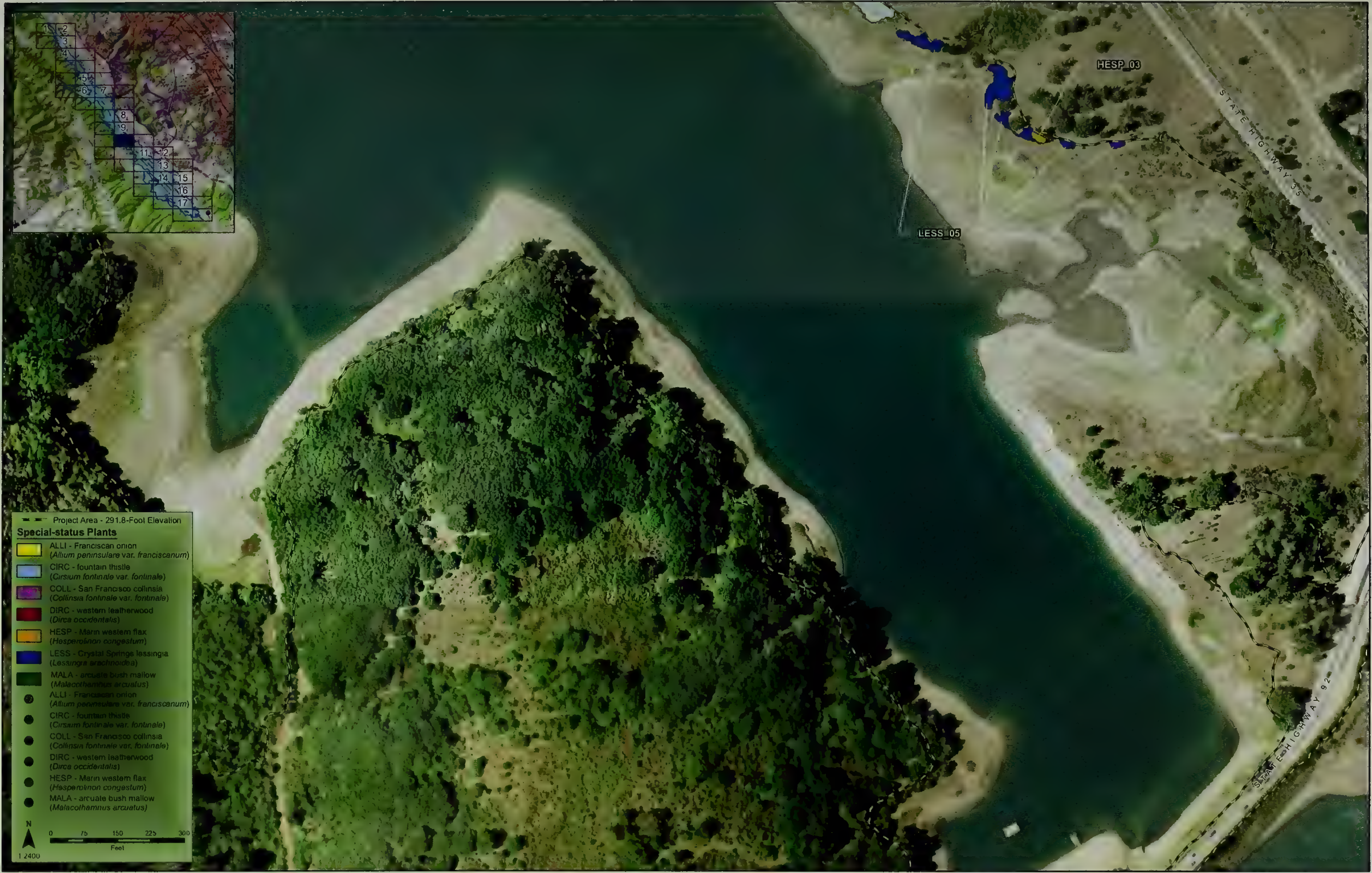
Mapped Locations of Special-Status Plant Species


LESS_03
HESP_02
LESS_04
LESS_04
CIRC_01
INTERSTATE HIGHWAY 280
STATE HIGHWAY 35
2
3
5
6
7
8
10
11
12
13
14
15
16
17
Project Area - 291 8-Foot Elevation
Special-status Plants
ALLI - Franciscan onion (Allium peninsulare var. franciscanum)
CIRC - fountain thistle (Cirsium fontinale var. fontinale)
COLL - San Francisco collinsia (Collinsia fontinale var. fontinale)
DIRC - western leatherwood (Dirca occidentalis)
HESP - Marin western flax (Hesperolinon congestum)
LESS - Crystal Springs lessingia (Lessingia arachnoidea)
MALA - arcuate bush mallow (Malacothamnus arcuatus)
ALLI - Franciscan onion (Allium peninsulare var. franciscanum)
CIRC - fountain thistle (Cirsium fontinale var. fontinale)
COLL - San Francisco collinsia (Collinsia fontinale var. fontinale)
DIRC - western leatherwood (Dirca occidentalis)
HESP - Marin western flax (Hesperolinon congestum)
MALA - arcuate bush mallow (Malacothamnus arcuatus)
0
75
150
225
300
Feet
1 2400

Lower Crystal Springs Dam Improvement Project Biological Resources Technical Report

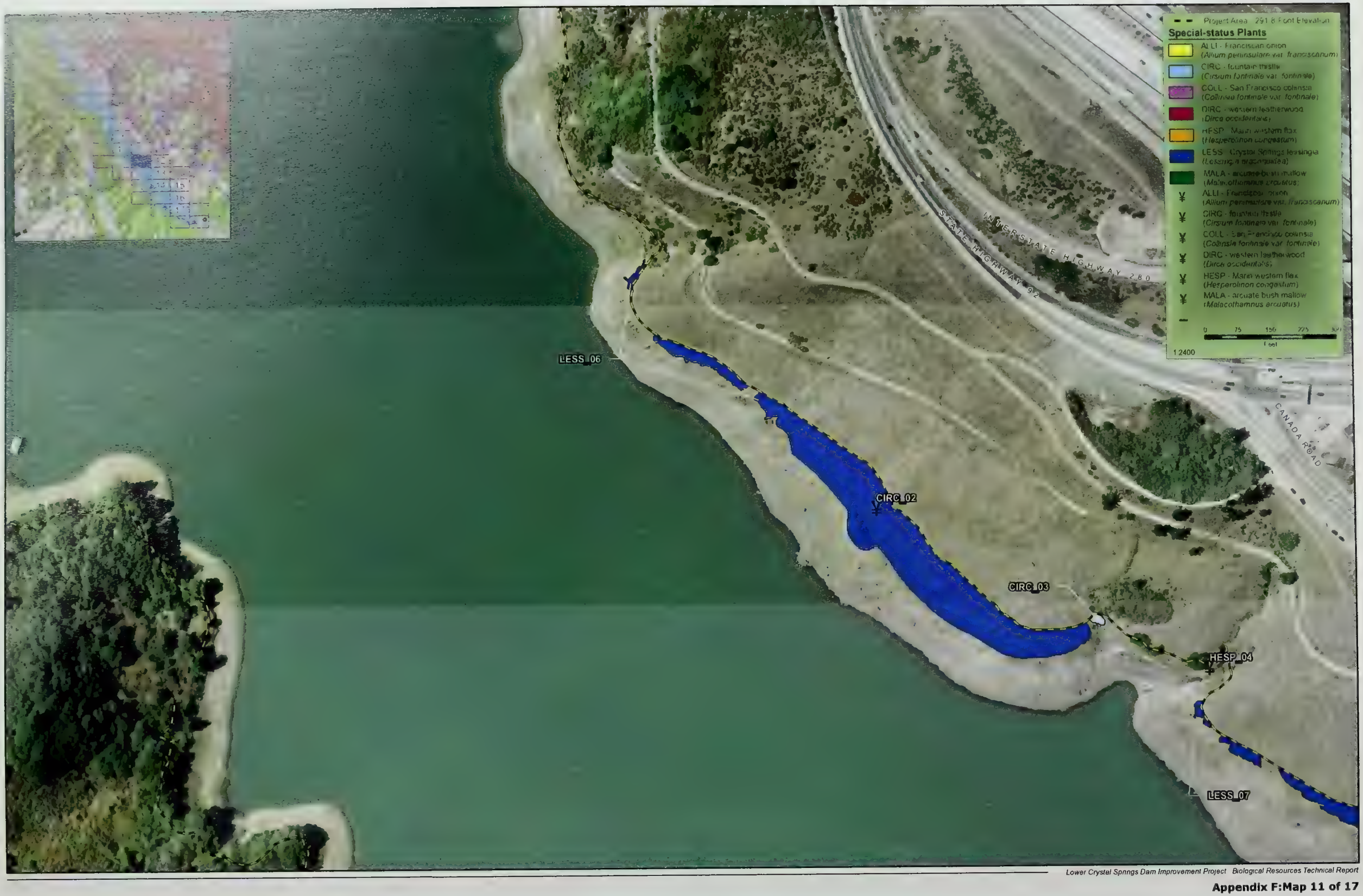
Appendix F: Map 9 of 17

Mapped Locations of Special-Status Plant Species


HESP_03
LESS_05
STATE HIGHWAY 35
STATE HIGHWAY 92
1 2 3 4 5 6 7 8 9 11 12 13 14 15 16 17
Project Area - 291.8-Foot Elevation
Special-status Plants
ALLI - Franciscan onion (Allium peninsulare var. franciscanum)
CIRC - fountain thistle (Cirsium fontinale var. fontinale)
COLL - San Francisco collinsia (Collinsia fontinale var. fontinale)
DIRC - western leatherwood (Dirca occidentalis)
HESP - Marin western flax (Hesperolinon congestum)
LESS - Crystal Springs lessingia (Lessingia arachnoidea)
MALA - arcuate bush mallow (Malacothamnus arcuatus)
ALLI - Franciscan onion (Allium peninsulare var. franciscanum)
CIRC - fountain thistle (Cirsium fontinale var. fontinale)
COLL - San Francisco collinsia (Collinsia fontinale var. fontinale)
DIRC - western leatherwood (Dirca occidentalis)
HESP - Marin western flax (Hesperolinon congestum)
MALA - arcuate bush mallow (Malacothamnus arcuatus)
N
0 75 150 225 300
Feet
1:2400

Appendix F:Map 10 of 17

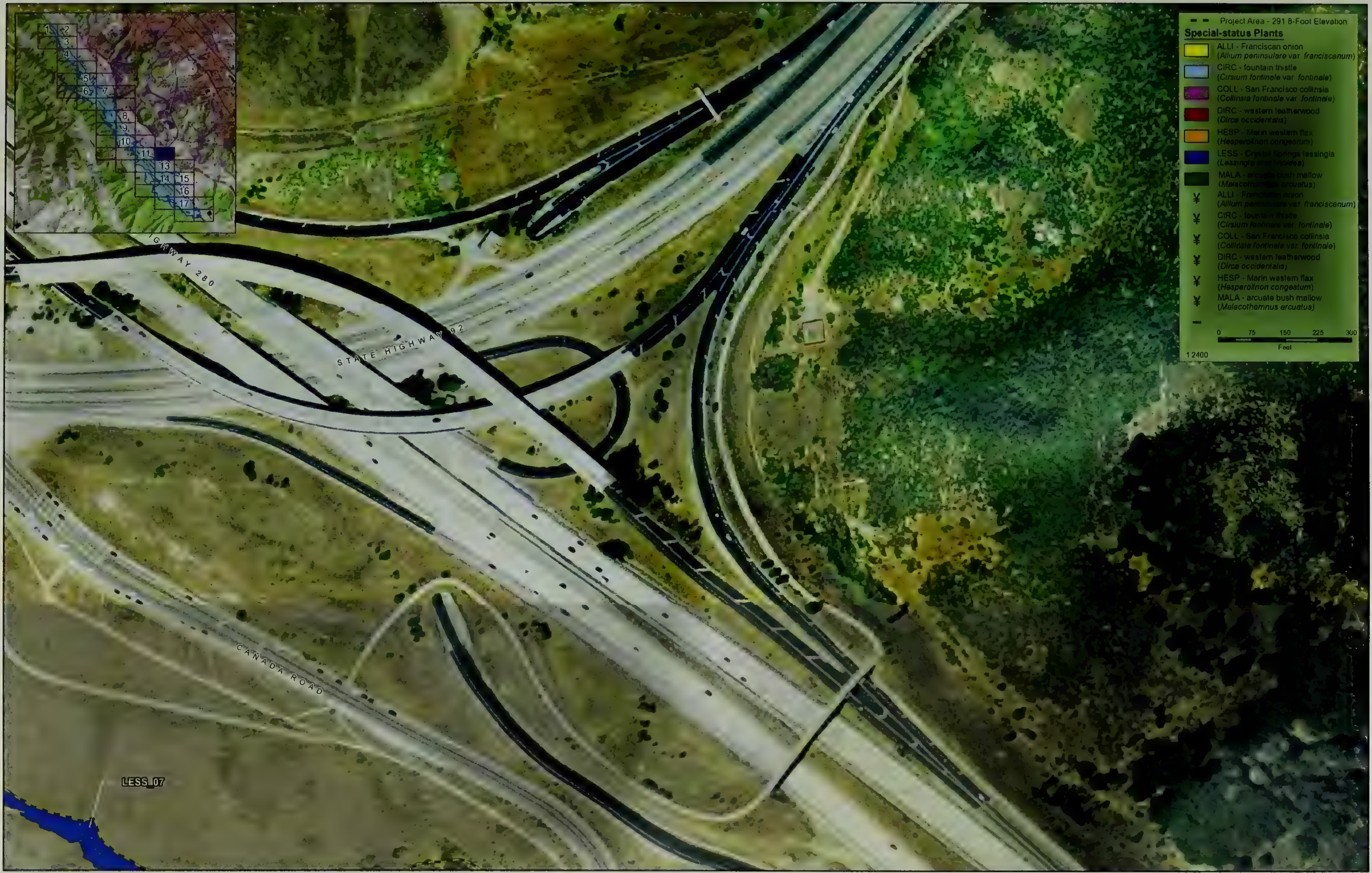
Mapped Locations of Special-Status Plant Species


Project Area 291.8 Foot Elevation
Special-status Plants
ALLI - Franciscan onion (Allium peninsulare var. franciscanum)
CIRC - fountain thistle (Cirsium fontinale var. fontinale)
COLL - San Francisco collinsia (Collinsia fontinale var. fontinale)
DIRC - western leatherwood (Dirca occidentalis)
HESP - Marin western flax (Hesperolinon congestum)
LESS - Crystal Springs lessingia (Lessingia arachnoidea)
MALA - arcuate bush mallow (Malacothamnus arcuatus)
ALLI - Franciscan onion (Allium peninsulare var. franciscanum)
CIRC - fountain thistle (Cirsium fontinale var. fontinale)
COLL - San Francisco collinsia (Collinsia fontinale var. fontinale)
DIRC - western leatherwood (Dirca occidentalis)
HESP - Marin western flax (Hesperolinon congestum)
MALA - arcuate bush mallow (Malacothamnus arcuatus)
0
75
150
225
300
Feet
1:2400
INTERSTATE HIGHWAY 280
STATE HIGHWAY 92
CANADA ROAD
LESS_06
CIRC_02
CIRC_03
HESP_04
LESS_07

Lower Crystal Springs Dam Improvement Project Biological Resources Technical Report

Appendix F:Map 11 of 17

Mapped Locations of Special-Status Plant Species


Project Area - 291 8-Foot Elevation
Special-status Plants
ALLI - Franciscan onion (Allium peninsulare var. franciscanum)
CIRC - fountain thistle (Cirsium fontinale var. fontinale)
COLL - San Francisco collinsia (Collinsia fontinale var. fontinale)
DIRC - western leatherwood (Dirca occidentalis)
HESP - Marin western flax (Hesperolinon congestum)
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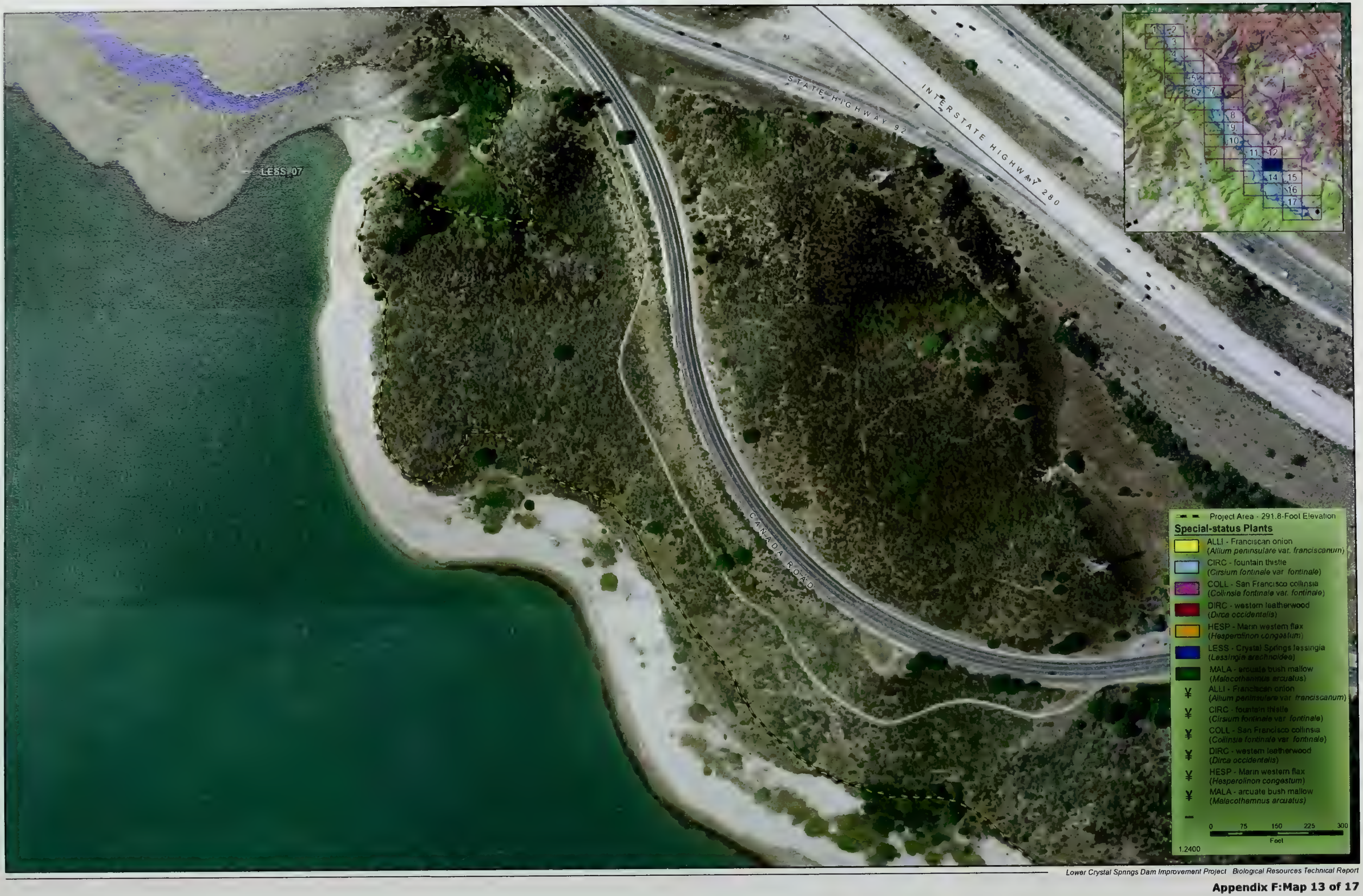
MALA - arcuate bush mallow (Malacothamnus arcuatus)
ALLI - Franciscan onion (Allium peninsulare var. franciscanum)
CIRC - fountain thistle (Cirsium fontinale var. fontinale)
COLL - San Francisco collinsia (Collinsia fontinale var. fontinale)
DIRC - western leatherwood (Dirca occidentalis)
HESP - Marin western flax (Hesperolinon congestum)
MALA - arcuate bush mallow (Malacothamnus arcuatus)
0 75 150 225 300
Feet
1:2400
1 2 3 4 5 6 7 8 9 10 11 13 14 15 16 17
HIGHWAY 280
STATE HIGHWAY 92
CANADA ROAD
LESS_07

Lower Crystal Springs Dam Improvement Project Biological Resources Technical Report

Appendix F:Map 12 of 17

Mapped Locations of Special-Status Plant Species


LESS_07
STATE HIGHWAY 92
INTERSTATE HIGHWAY 280
CANADA ROAD
1
2
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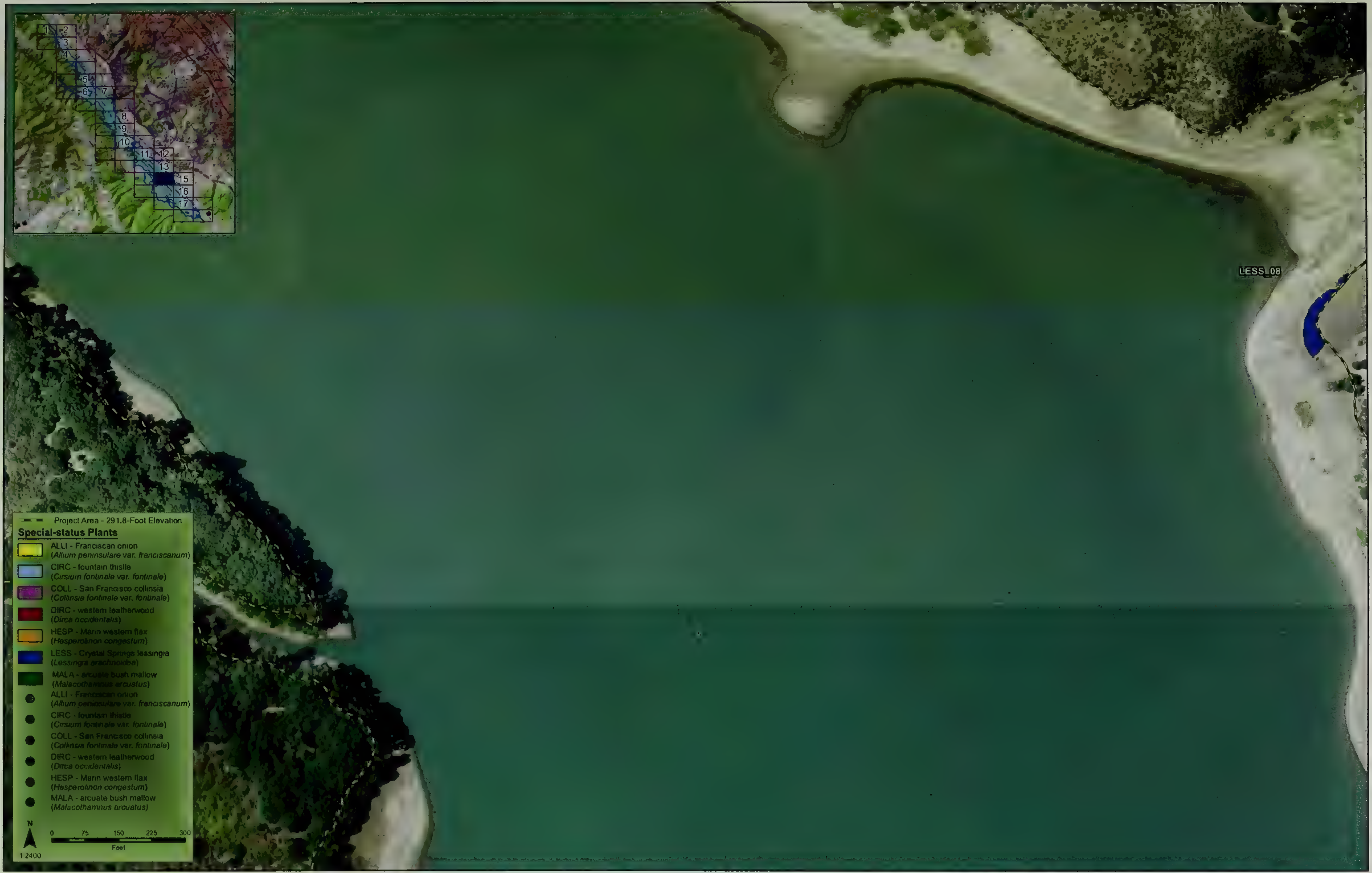
8
9
10
11
12
13
14
15
16
17
Project Area - 291.8-Foot Elevation
Special-status Plants
ALLI - Franciscan onion (Allium peninsulare var. franciscanum)
CIRC - fountain thistle (Cirsium fontinale var. fontinale)
COLL - San Francisco collinsia (Collinsia fontinale var. fontinale)
DIRC - western leatherwood (Dirca occidentalis)
HESP - Marin western flax (Hesperolinon congestum)
LESS - Crystal Springs lessingia (Lessingia arachnoides)
MALA - arcuate bush mallow (Malacothamnus arcuatus)
ALLI - Franciscan onion (Allium peninsulare var. franciscanum)
CIRC - fountain thistle (Cirsium fontinale var. fontinale)
COLL - San Francisco collinsia (Collinsia fontinale var. fontinale)
DIRC - western leatherwood (Dirca occidentalis)
HESP - Marin western flax (Hesperolinon congestum)
MALA - arcuate bush mallow (Malacothamnus arcuatus)
0
75
150
225
300
Feet
1:2400

Appendix F:Map 13 of 17

Mapped Locations of Special-Status Plant Species


1
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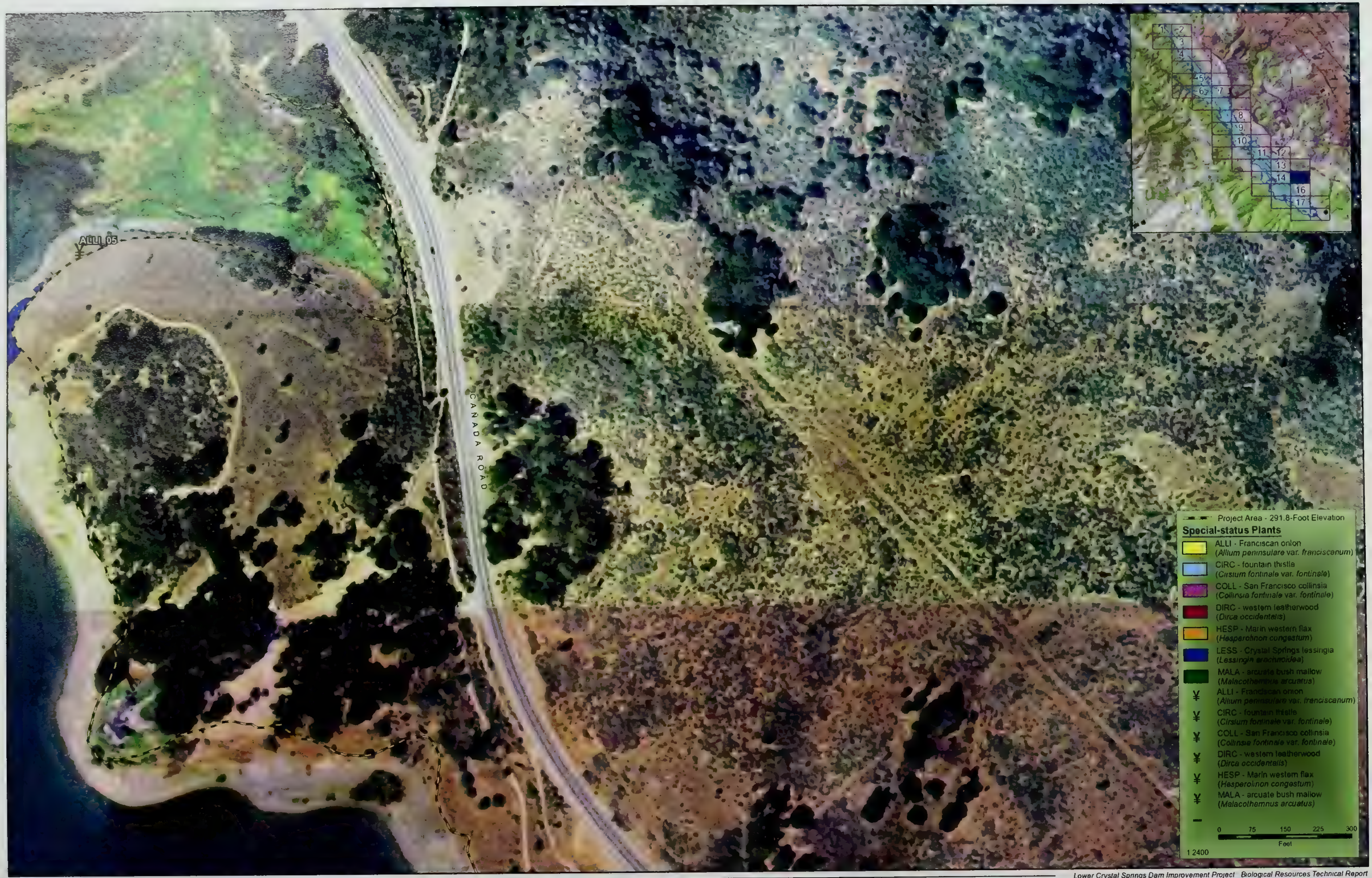
13
15
16
17
LESS_08
Project Area - 291.8-Foot Elevation
Special-status Plants
ALLI - Franciscan onion (Allium peninsulare var. franciscanum)
CIRC - fountain thistle (Cirsium fontinale var. fontinale)
COLL - San Francisco collinsia (Collinsia fontinale var. fontinale)
DIRC - western leatherwood (Dirca occidentalis)
HESP - Marin western flax (Hesperolinon congestum)
LESS - Crystal Springs lessingia (Lessingia arachnoidea)
MALA - arcuate bush mallow (Malacothamnus arcuatus)
ALLI - Franciscan onion (Allium peninsulare var. franciscanum)
CIRC - fountain thistle (Cirsium fontinale var. fontinale)
COLL - San Francisco collinsia (Collinsia fontinale var. fontinale)
DIRC - western leatherwood (Dirca occidentalis)
HESP - Marin western flax (Hesperolinon congestum)
MALA - arcuate bush mallow (Malacothamnus arcuatus)
N
0
75
150
225
300
Feet
1:2400

Appendix F:Map 14 of 17

Mapped Locations of Special-Status Plant Species


ALLI_05
CAÑADA ROAD
1
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3
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5
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7
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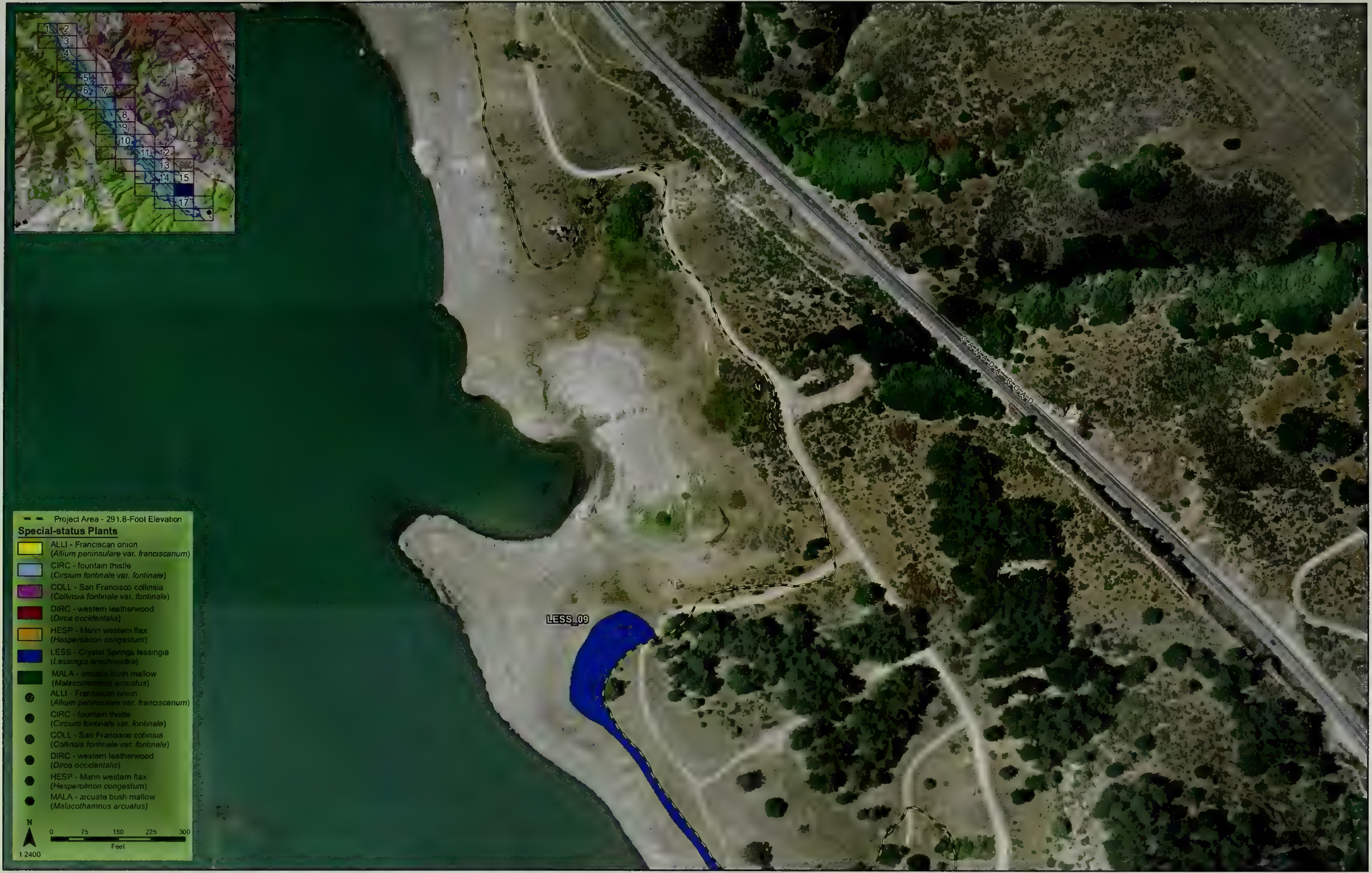
11
12
13
14
16
17
Project Area - 291.8-Foot Elevation
Special-status Plants
ALLI - Franciscan onion (Allium peninsulare var. franciscanum)
CIRC - fountain thistle (Cirsium fontinale var. fontinale)
COLL - San Francisco collinsia (Collinsia fontinale var. fontinale)
DIRC - western leatherwood (Dirca occidentalis)
HESP - Marin western flax (Hesperolinon congestum)
LESS - Crystal Springs lessingia (Lessingia arachnoidea)
MALA - arcuate bush mallow (Malacothamnus arcuatus)
ALLI - Franciscan onion (Allium peninsulare var. franciscanum)
CIRC - fountain thistle (Cirsium fontinale var. fontinale)
COLL - San Francisco collinsia (Collinsia fontinale var. fontinale)
DIRC - western leatherwood (Dirca occidentalis)
HESP - Marin western flax (Hesperolinon congestum)
MALA - arcuate bush mallow (Malacothamnus arcuatus)
0
75
150
225
300
Feet
1 2400

Appendix F:Map 15 of 17

Mapped Locations of Special-Status Plant Species


Project Area - 291.8-Foot Elevation
Special-status Plants
ALLI - Franciscan onion (Allium peninsulare var. franciscanum)
CIRC - fountain thistle (Cirsium fontinale var. fontinale)
COLL - San Francisco collinsia (Collinsia fontinale var. fontinale)
DIRC - western leatherwood (Dirca occidentalis)
HESP - Marin western flax (Hesperolinon congestum)
LESS - Crystal Springs lessingia (Lessingia arachnoidea)
MALA - arcuate bush mallow (Malacothamnus arcuatus)
ALLI - Franciscan onion (Allium peninsulare var. franciscanum)
CIRC - fountain thistle (Cirsium fontinale var. fontinale)
COLL - San Francisco collinsia (Collinsia fontinale var. fontinale)
DIRC - western leatherwood (Dirca occidentalis)
HESP - Marin western flax (Hesperolinon congestum)
MALA - arcuate bush mallow (Malacothamnus arcuatus)
N
1:2400
0
75
150
225
300
Feet
CANADA ROAD
LESS_09
1
2
3
4
5
6
7
8
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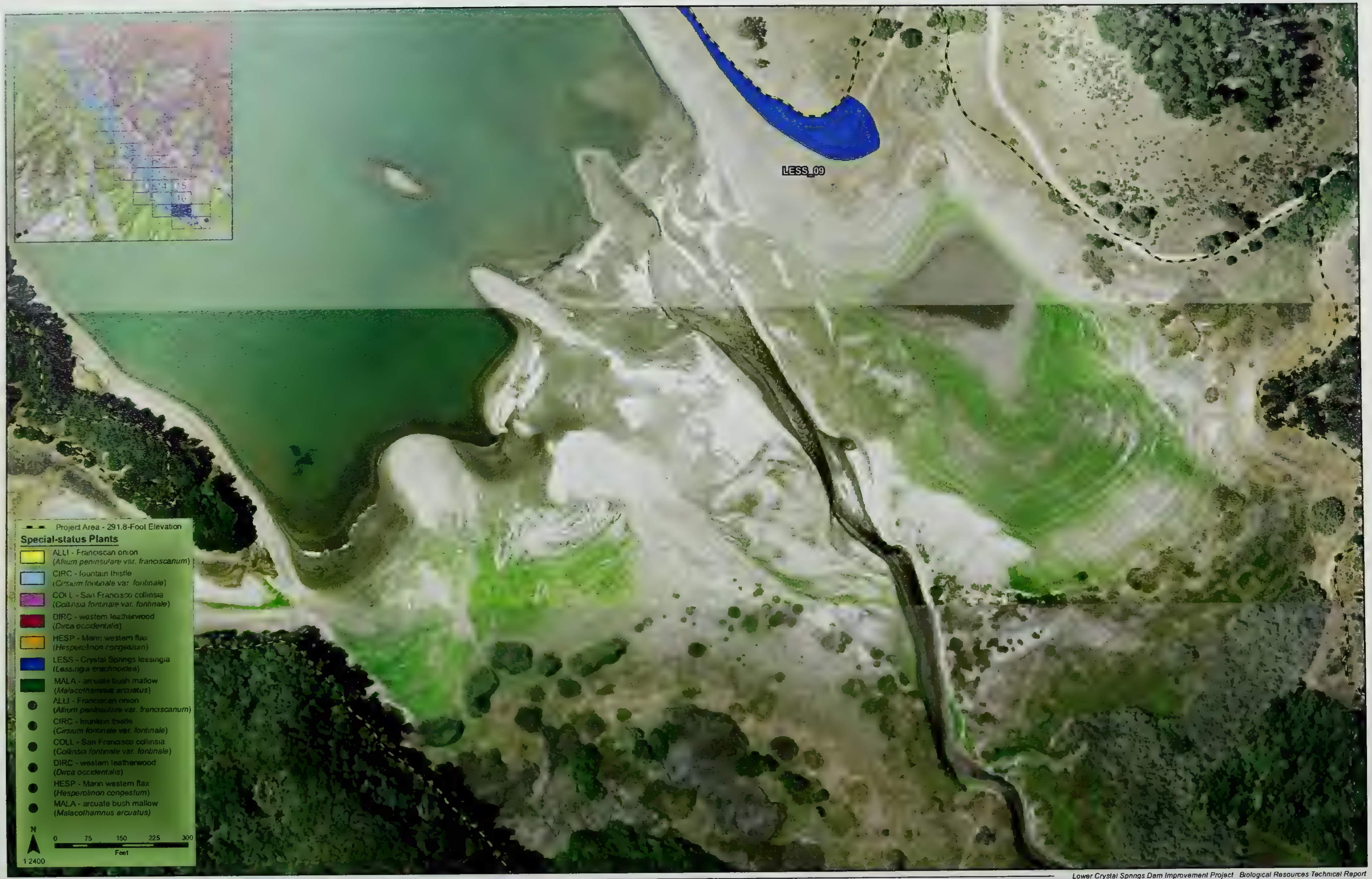
15
17

Lower Crystal Springs Dam Improvement Project Biological Resources Technical Report

Appendix F:Map 16 of 17

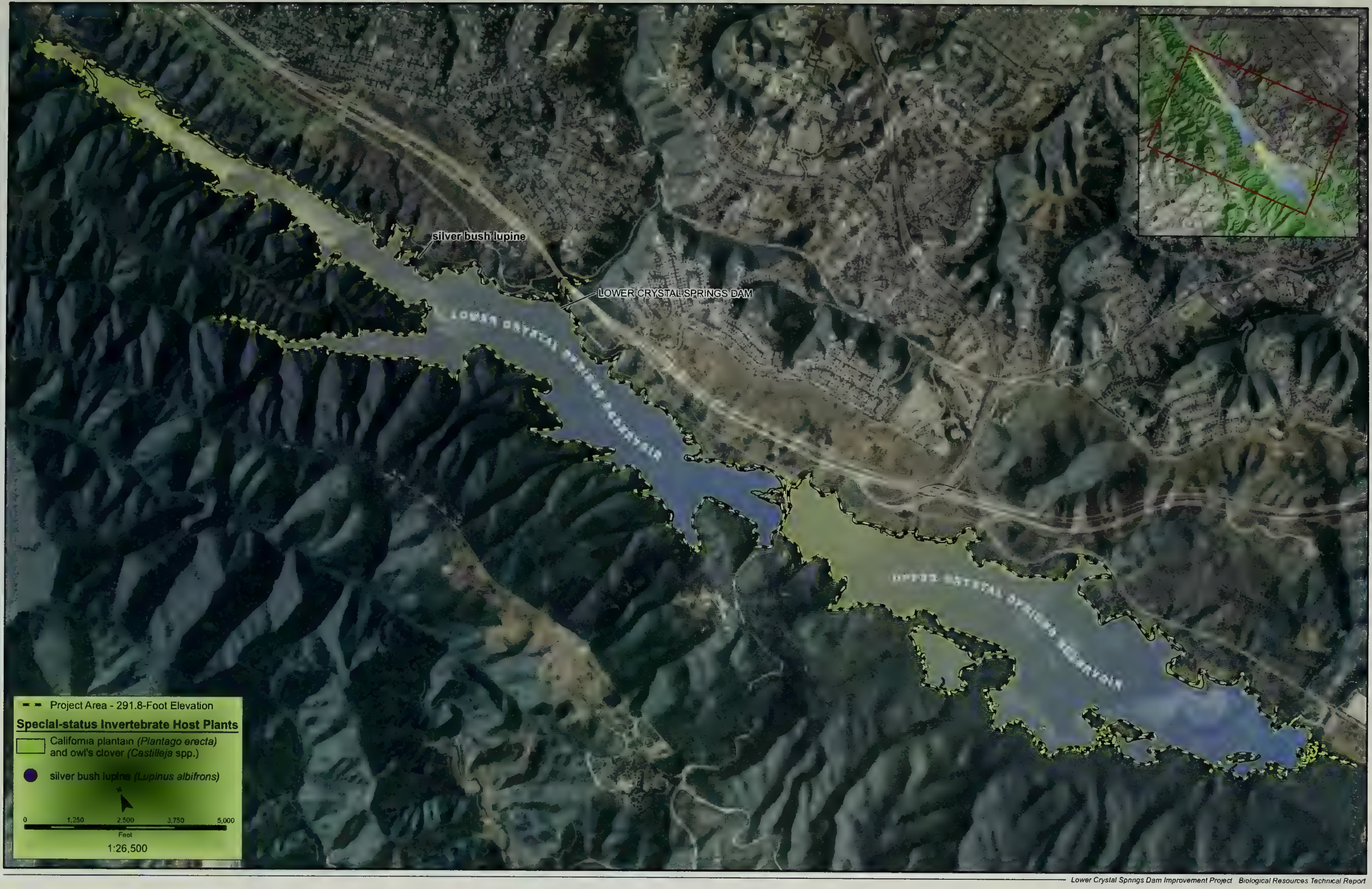
Mapped Locations of Special-Status Plant Species


LESS_09
Project Area - 291.8-Foot Elevation
Special-status Plants
ALLI - Franciscan onion
(Allium peninsulare var. franciscanum)
CIRC - fountain thistle
(Cirsium fontinale var. fontinale)
COLL - San Francisco collinsia
(Collinsia fontinale var. fontinale)
DIRC - western leatherwood
(Dirca occidentalis)
HESP - Marin western flax
(Hesperolinon congestum)
LESS - Crystal Springs lessingia
(Lessingia arachnoidea)
MALA - arcuate bush mallow
(Malacothamnus arcuatus)
ALLI - Franciscan onion
(Allium peninsulare var. franciscanum)
CIRC - fountain thistle
(Cirsium fontinale var. fontinale)
COLL - San Francisco collinsia
(Collinsia fontinale var. fontinale)
DIRC - western leatherwood
(Dirca occidentalis)
HESP - Marin western flax
(Hesperolinon congestum)
MALA - arcuate bush mallow
(Malacothamnus arcuatus)
N
1:2400
0
75
150
225
300
Feet

Lower Crystal Springs Dam Improvement Project Biological Resources Technical Report

Appendix F:Map 17 of 17

Mapped Locations of Special-Status Plant Species


silver bush lupine
LOWER CRYSTAL SPRINGS DAM
LOWER CRYSTAL SPRINGS RESERVOIR
UPPER CRYSTAL SPRINGS RESERVOIR
Project Area - 291.8-Foot Elevation
Special-status Invertebrate Host Plants
California plantain (Plantago erecta) and owl's clover (Castilleja spp.)
silver bush lupine (Lupinus albifrons)
0
1,250
2,500
3,750
5,000
Feet
1:26,500

Appendix G :Map 1 of 1

Mapped Locations of Host Plants for Special-status Invertebrate Species

APPENDIX J

Supporting Documentation for Vegetation/ Habitat Impacts

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ESA+ORION
a joint venture

Technical Memorandum

date July 22, 2009, revised November 30, 2009

to Anna Roche, SFPUC and Erika Lovejoy, MEA

from Barbara Leitner; Rachel Brush; Thomas Roberts, CWB; and Joyce Hsiao

subject Supporting Documentation for CEQA Impact Analysis of Vegetation/Habitat Impacts Due to Proposed Future Operations of Crystal Springs Reservoir under the Lower Crystal Springs Dam Improvements Project

Introduction

The objective of the Lower Crystal Springs Dam Improvements (LCSDI) project is to make structural improvements to Lower Crystal Springs Dam to comply with requirements of the California Department of Water Resources, Division of Safety of Dams to accommodate the probable maximum flood. These improvements would enable the SFPUC to restore use of the historical capacity of Crystal Springs Reservoir and to revise its current operations to increase the maximum normal operating level by four feet from the current level, increasing it from 283.8 to 287.8 ft (NGVD 29).

Elevating Crystal Springs Reservoir operating levels would inundate a portion of the existing wetland habitats to the extent that they would be converted to deepwater habitat; i.e., open water, as well as inundate some existing upland habitats. Some wetland habitats would persist, although their species composition could change due to the altered pattern of inundation. New wetland habitats would form within the new, higher operating elevations currently supporting upland habitats. It is also anticipated that some wetlands would be induced at elevations above the reservoir operating elevations, as groundwater, seeps, and streams approach a new equilibrium with the higher reservoir elevations. Estimation of the net change in habitat types and distribution around Crystal Springs Reservoir from these factors is required for the CEQA impact assessment.

The purpose of this technical memorandum is to provide the supporting details of the CEQA analysis of impacts on biological resources due to operational effects of the LCSDI project. The reader is referred to Section 5.10 of the LCSDI EIR for the complete discussion of impacts and the appropriate context of the information in this memorandum.

Information Sources

The following information was used to analyze and estimate the vegetation impacts that would result from increasing the maximum normal operating level of Crystal Springs Reservoir under the LCSDI project:

1. Elevations of reservoir topography based on LiIDAR contour mapping of the Crystal Springs Reservoir and perimeter:

   LiDAR Mapping
   Airborne 1 Corporation
   300 N. Sepulveda Boulevard, #1060, El Segundo, California, 90245
   Phone: 310-414-7400 Fax: 310-414-7409
   Contact: Sean Bower, LiDAR Team Data Analyst Team Leader
   Delivery Date: January 18, 2007
   Data Description: 1 DVD containing 1 Meter Grids in ESRI ASC format in California State Plane, Zone 3, US Survey Feet, NAD83/NAVD88
   Data Accuracy: 100% of points falling within +/- 0.50 ft, 95% Confidence Level

2. Geographic information system (GIS) files of mapped vegetation at elevations below 291.8 ft surrounding Crystal Springs Reservoir prepared as part of the technical report on biological resources for the LCSDI Project (Entrix, 2006)

3. Hetch Hetchy/Local Simulation Model (HH/LSM) output of predicted Crystal Springs Reservoir storage volumes under the proposed project (Steiner, 2009)

4. Information regarding operating range of Crystal Springs Reservoir (Briggs and Cameron, 2009)

5. Data on existing and predicted inundation frequencies and average operating elevations of Crystal Springs Reservoir, presented in Section 5.12, Hydrology and Water Quality, of the LCSDI EIR.

Background

Background of the Data Set

ESA + Orion was provided with several GIS shapefiles from Entrix that contain data on biological resources at the Crystal Springs Reservoir (vegetation communities, special status plant locations, herpetology survey findings) as well as a high-resolution aerial image for the project area and LiDAR contour data (one foot intervals).

The vegetation communities layer, which includes the wetland polygons from the verified wetland delineation, has metadata that describes the steps of the mapping process. In addition, the Draft Biological Technical Reports from Entrix also includes a discussion of the methods for the vegetation mapping. A summary is provided below.

Vegetation mapping began in 2006 using a combination of hand delineation of vegetation polygons on printed aerial images and recorded GPS data[1]. This information was then digitized by hand using ArcGIS (ArcMap 9.x) and an aerial image with one pixel of resolution. High resolution LiDAR data that provide one foot elevation contour intervals were obtained at the time that digitization was taking place and with this combination of data the upper limit of the project area mapping was defined as 291.8 feet. The working vegetation map was then field verified (a process often referred to as "ground-truthing") to ensure accuracy of the mapped polygons and to identify any gaps. In general, vegetation polygons were mapped at a size of one acre and larger. The digital polygons were then modified as needed according to the results of the field verification.

The mapped vegetation communities are based on Holland's description of natural communities (Holland, 1986) and on the Cowardin wetland classification (Cowardin et al., 1979). A description of how these resources are applied to the project can be found in the project EIR and Wetland Determination Report.

The methods undertaken by Entrix to map the vegetation communities are extremely detailed and widely used. Mapping vegetation by hand digitization is generally considered to be the most accurate and cost effective method for projects of limited geographic scope. Although it may seem that delineating the boundary between two vegetation types with a relatively similar image signature (e.g. coast live oak forest and mixed evergreen forest) would be somewhat arbitrary, determining the boundary on the ground is often not clear either. Ecotones (boundaries between two or more natural communities) are often a continuum or gradual transition rather than a clearly defined line, which makes the act of determining the boundary extremely difficult. However, informed professional judgment combined with effective ground-truthing was used to resolve uncertainties of this nature.

The GIS data (shapefiles) for the special status plant and animal populations and observations were collected in the field using a GPS unit. GPS units were used to map occurrence or observation points and population polygons. There is always some degree of error or geographic inaccuracy in the data collected using a GPS unit; but this is unavoidable. The amount of error can be influenced by a variety of variables including: defined accuracy of the individual GPS unit, satellite reception, and potential for differential correction.

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[1] The unit used for the GPS work was a hand-held Trimble CE Series, which has sub-meter accuracy, and is currently the most accurate hand-held GPS equipment available for civilian use. The level of accuracy depends greatly on the number of satellites available, the geometry of the satellites, and the amount of interference (clouds, trees, mountains, etc), which was substantial in steep canyons and wooded areas around Crystal Springs Reservoir. The GPS, although essential to the mapping efforts, provided just a basis for wetland boundaries and additional refinement was added to it. Wetland boundaries and soil pits were hand drawn on large-scale aerial images during field work, and all the mapped data was edited by hand using the field-verified map notes. This was especially applicable to wetland areas beneath tree canopy.

Definition of the Data Set

Given the information sources described above, ESA+Orion worked with the data in order to identify and define the appropriate data set relevant to the analysis. This included the following steps:

1. LiIDAR one-foot increment elevations of the reservoir periphery were superimposed over the mapped GIS vegetation cover layer. The vegetation cover polygons were then divided into one-foot increments to determine the type and extent of vegetation by elevation. A total of 1,479.5 acres, plus an additional 177 acres not attributed to a cover type, were categorized from elevations 0 to 295 ft. **Table J-1** presents this preliminary, raw data.

2. GIS convention is to report acreage to four decimal places, but for this analysis the actual precision was more appropriately reported as a single decimal place.

3. Delete all data at elevations greater than 292 ft. Vegetation was not consistently mapped above 292 ft because the limits of the project area were defined as the 292-ft contour interval. Little if any impact from the proposed project would be expected to occur above this elevation because the maximum operating elevation, that is, the highest elevation the reservoir would be expected to sustain for periods long enough to support the development of shoreline wetlands, is proposed to be 288 ft. Although this analysis predicts that higher prevailing groundwater elevations with the project could "induce" (rather than directly cause) the formation of wetlands higher than the proposed average operating elevation of 288 feet, it is anticipated that most of this effect would occur within the 4-foot elevation between 288 and 292 ft.

4. Combine "fluctuation zone/lacustrine" with "open water"; rename "lacustrine/unvegetated".

5. Delete all data at elevations below 263 ft. The full extent of wetlands were mapped as far as they could be seen, including submerged wetlands that were mapped by boat. Less than 1.5 percent of the total mapped wetland vegetation was found at elevations below 263 feet, and this elevation was concluded to be the practical lower limit of wetlands at the time of the survey. In fact, it would be difficult to define a lower elevation limit in the reservoir below which inundated wetlands could not occur or be mapped, since seasonal wetlands can form at any elevation as the reservoir subsides. This is part of the phenomenon of establishing a baseline as a single point in time in a highly variable system. In the baseline, no significant amount of wetland vegetation was present below 263 ft, and the lacustrine/unvegetated cover type at these elevations is expected to remain unchanged under the proposed project. This acreage, totaling 913 acres, was eliminated from further analysis. Therefore, the relevant range of elevations subject to this analysis was defined as 263 – 292 ft.

6. The proportion of acreage with high and low slope was also calculated, by one-foot increments. Throughout the relevant range, 263 – 292 ft, slopes of 0-6% averaged 40% of the total area and this proportion was fairly consistent among the one-foot increments.[2] To find the proportion of acreage in the 0-8% slope range found to consistently support wetland vegetation, we estimated that the extent

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[2] Due to an error, the area within the slope interval 0-6 percent was calculated, rather than the slope interval 0-8 percent. The calculation involves identifying and summing the acreage within each slope polygon and elevation interval. Because the process is so laborious, the investigators chose to extrapolate the acreage in the additional slope interval, 6-8 percent slope. This extrapolation was justified on the basis that the average slope in the elevation range of interest is very consistent, as evidenced by the consistent number of total acres in each additional foot of reservoir elevation. The interval 0-8 percent is numerically one-third larger than the interval 0-6 percent, so we conservatively estimated that the area in the additional slope interval 6-8 percent was one-fourth larger than the area in the 0-6 percent slope interval, thus predicting a conservative (that is, low) estimate of the extent of potentially suitable habitat for the development of wetlands.

of 0-8% slope would encompass one-third more area than the 0-6% interval (since the 0-8% slope interval range is one-third larger than the 0-6% interval). One-third more area would encompass 54% of the total area, so we conservatively assumed that 50% of the acreage is within the low slope interval 0-8%, and 50% is steeper than 8%.

7. Delete "developed" areas, totaling 0.6 acres, within the 263 – 292 ft range. Habitat characteristics of these small areas could not be determined. If this acreage is developed, it is likely to remain so under future conditions. As a result, it was eliminated from further analysis.

8. Extend all vegetation polygons within the 291 – 292 ft range up to the 292 ft LiDAR contour interval to calculate the total acreage by vegetation type within this range by extending the cover type polygon having the longest shared border. Initial vegetation mapping was completed in the range between 0 – 291.8 ft based on a contour shapefile that was not derived from the LiDAR data and therefore did not completely cover the 291 – 292 ft range. An additional 13.7 acres of vegetation is now accounted for in the 291 – 292 ft range to bring the total acres of habitat to 23.6 between 291 and 292 ft.

9. Rearrange the columns of habitats to group upland habitats together and wetland habitats together (no change in acreage).

10. Assign to lacustrine/unvegetated 0.7 ac of woody upland vegetation in elevations less than 283 ft. This anomalous data was due to conditions such as overhanging tree canopy. Wherever wetland vegetation grew below overhanging tree canopy, wetlands were given priority for mapping, so logically, tree canopy mapped over low elevations were overhanging lacustrine/unvegetated habitat. One example of this situation is at the southern end of Upper Crystal Springs Reservoir, where willows and other riparian vegetation growing on the floodplain form a continuous canopy over the deeply incised Laguna Creek channel. Standard practice in wetland delineations is to map a riparian type as continuous where the canopy cover is continuous, yet when LiDAR topographic mapping is superimposed on the mapped, continuous canopy, riparian vegetation appears to grow at much greater depth than it actually does.

11. Small amounts of grassland totaling 1.2 acre were mapped between elevations 264 and 279 ft. These areas were reassigned to lacustrine/unvegetated to correct for anomalous data.

12. To correct for anomalous data, acreages assigned to riparian vegetation in elevations 263 – 274 ft, normally areas inundated for too long to support woody riparian vegetation, were reassigned to lacustrine/unvegetated. For example, "riparian" was mapped as complete canopy at the mouth of Laguna Creek. LiDAR shows an incised drainage passing through the riparian stand, so riparian canopy cover was assigned to the lower elevation of the incised channel, even though the trees themselves were growing only on the banks at higher elevations (B. Leitner, Orion, pers., obs.). By superimposing the mapped, continuous canopy over the LiDAR mapping, riparian vegetation appears to grow at much greater depth than it actually does. These anomalies were corrected by re-assigning the area within the incised channel to lacustrine/unvegetated. Such areas totaled 1.9 acre.

13. *Scirpus/Typha* mapped at elevations 263 – 269 ft, was reassigned to lacustrine/unvegetated. These areas had inundation frequencies of 85% or more, ecologically would have limited potential to support this vegetation type, and could be attributable to a small amount of sampling error (less than 0.4 percent of the total of *Scirpus/Typha* and Herbaceous Wetland acreage, which is combined for the purpose of predicting impacts. This simplification was employed where the acreage for any given cover type in a one-foot elevation increment was less than one-half acre, which was 269 ft in the case of *Scirpus/Typha*. A total of 0.9 acre was thus reassigned.

14. Delete all acreage assigned to lacustrine/unvegetated below 276 ft on the basis that conditions would remain unchanged under the proposed project. This eliminated 90.7 acres.

Following this interpretation, the acreage in the relevant data set totals 488.6 acres, shown in **Table J-2**.

Approach to Analysis

The analysis of impacts on natural communities is based on broad ecological principles in combination with empirical data collected during wetland delineation and habitat surveys conducted in 2006 around the periphery of Crystal Springs Reservoir. The basic assumption used in the analysis is that the current extent and elevational limit of a natural community (approximated by cover types in the GIS mapping) is closely associated with the prevailing pattern of inundation, expressed as inundation frequency. **Table J-3** shows the relevant data set and compares it to the current and future, with-project inundation frequencies.

Table J-3 also provides color coding to depict how habitat types at different elevation ranges are predicted to change under the future, with project conditions. Where GIS data showed the acreage of a cover type declined sharply from a one-foot elevation increment to the next, the inundation frequency at that elevation was concluded to be the limiting factor. **Table J-4** summarizes the results of the predicted changes acreages in vegetation and habitat types that would occur with the proposed long-term operation of Crystal Springs Reservoir following implementation of the LCSDI project. Table J-4 includes notes that explain the rationale used in making each determination and cross-references the detailed discussion below.

The rationale (identified as "R1", "R2" and so on) used to predict how each cover type responds individually to prevailing conditions is described in the paragraphs that follow.

R1. Changes in inundation frequencies are predicted to change the type and extent of cover types. Inundation frequencies at Crystal Springs Reservoir (see columns ** in Table J-3) would remain essentially unchanged at elevations above 292 ft (above the spillway elevation) and below 263 ft, which was reported as the lower limit of herbaceous wetland vegetation. Therefore, the elevation from 263 – 292 ft is the range in which vegetation change is predicted. A total of 488.6 acres of is encompassed in this elevation range, as described below under "Definition of Data Set" (See Note 1, Table J-4).

R2. The lower limit of riparian cover can be predicted based on inundation frequency. GIS data showed that riparian cover dropped off sharply below elevation 274 – 275 ft, which corresponds to a current inundation frequency of about 61%. This elevation is assumed to be the lower limit of suitable conditions for riparian vegetation. Where future inundation frequency is predicted to remain less than 61%, existing riparian cover is predicted to persist (see Note 2, Table J-4). Where inundation frequency is predicted to be greater than 61% with implementation of the proposed project, existing riparian cover is predicted to be converted to other wetland types (see Note 8, Table J-4). It is assumed that slope and soil conditions currently supporting wetland (and riparian) vegetation within the future fluctuation zone will continue to do so under future with-project conditions, which is why all riparian habitat is predicted to be converted to other wetlands rather than lacustrine habitat. Slope was used as a predictive factor only for areas that are currently mapped as lacustrine/unvegetated.

R3. The lower limit of *Scirpus/Typha* cover can be predicted based on inundation frequency. The lower limit of *Scirpus/Typha* is currently 269 – 270 ft[3], which is correlated with an inundation frequency of about 81%. This is supported by the scientific literature indicating a requirement for about 9 months of inundation for optimum growth of this vegetation. Where inundation frequency is predicted to remain at no more than 81% (277 ft and higher), the extent of existing *Scirpus/Typha* cover is predicted to remain unchanged (see Note 3, Table J-4). Where future inundation frequency is predicted to increase to more than 81% (below 277 ft), existing *Scirpus/Typha* cover is predicted to be lost, converting to herbaceous wetland at depths of 12 ft or less below the average operating elevation[4] (see Note 9, Table J-4) or lacustrine/unvegetated at greater depths (see Note 10, Table J-4).

R4. Existing wetlands within the future fluctuation zone are assumed to be retained, although their composition and structure may change. It is assumed that slope and soil conditions currently supporting wetland vegetation within the future fluctuation zone will continue to do so under future with-project conditions in the fluctuation zone; that is, where inundation frequencies are greater than 0% and less than 100%. Although not quantifiable, it is likely that some riparian habitat in this zone will be converted to *Scirpus/Typha* or herbaceous wetland, and some herbaceous wetland may be converted to *Scirpus/Typha* because of changes in the predicted inundation patterns under the proposed project (see Note 9, Table J-4).

R5. The lower limit of wetland vegetation is determined by depth below average operating elevation. Through the comparison of LiDAR data and mapped wetland vegetation, ENTRIX concluded that most wetland vegetation grew no more than 12 feet below the average operating elevation, reported as 275.5 ft[5] (ENTRIX, 2008). In a changeable system, seasonal wetlands can form at any elevation where inundated habitat is exposed for several weeks during the growing season, so the actual extent of wetlands could vary from year to year. Thus, the lower limit of existing wetland cover (of all types, of which herbaceous wetland vegetation grew the lowest) was taken to be 263 – 264 ft. The future average operating elevation is predicted to be about 282 ft. Under proposed future conditions, the lower limit of wetland cover is predicted to be 12 ft lower, or 270 ft. Herbaceous wetland cover above 270 ft is predicted to persist (see Note 4, Table J-4), while herbaceous and *Scirpus/Typha* cover below 270 ft would be converted to lacustrine/unvegetated cover (see Notes 10 and 11, Table J-4).[6]

R6. Lacustrine/unvegetated is predicted to remain unchanged except where inundation frequency rises from below 5% to at least 5% and slopes are 0-8%. Most areas currently mapped as lacustrine/unvegetated are steep and rocky, conditions unsuitable for the development of wetland vegetation, even where the inundation frequency is high enough to support it (below 283 ft).

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[3] The lower elevational limit was generally taken as the one-foot increment containing at least 0.5 acre of the cover type.

[4] The average operating elevation for the purposes of this analysis is based on the elevation (in ft) that is predicted to be inundated 50 % of the time (based on HH/LSM model predictions). This corresponds to about 282 ft.

[5] More recent inundation frequency calculations have place the average operating elevating elevation at 276-277 ft, but we have retained the ENTRIX value for consistency here.

[6] The 12-foot generalization was not discussed in the wetland delineation, because it was not relevant to the determination of jurisdictional waters. Although LiDAR sampling was carried out after the fieldwork for the wetland delineation was completed, the LiDAR data were used to define the water elevation lines in the delineation report. The purposes of the wetland delineation and of the EIR analysis are different—by its nature, the wetland delineation is charged with identifying the current extent of wetlands, while the EIR analysis is required to predict impacts. The latter requires a broader, more synoptic view of a changeable system, and a lower level of precision is inherent in this analysis. As stated earlier, the wetlands below 263 feet comprise 0.4 percent of the total wetlands delineated. This far exceeds the level of precision in any EIR analysis we are aware of, and in most comparisons is also expected to exceed the year-to-year variation in seasonal wetlands at Crystal Springs Reservoir.

However, some mapped lacustrine/unvegetated areas are situated above herbaceous wetland vegetation, suggesting that the inundation regime, rather than substrate, is limiting. For the elevation range (283 – 287 ft), which contains 4.4 acres of lacustrine/unvegetated habitat, inundation frequencies are predicted to increase from below 5% to above 5%. Using the assumed 50% of area having a slope of 0 to 8%, 2.2 acres are predicted to develop wetland vegetation and 2.2 acres are predicted to persist as lacustrine/unvegetated habitat. (see Notes 5 and 14, Table J-4).

R7. The lower elevational limit of woody upland vegetation is determined by maximum reservoir elevations. The mapped lower limit of existing woody upland vegetation is about 283 ft, which corresponds to an inundation frequency of about 5%. In general, woody upland vegetation at elevations with projected future inundation frequencies of less than 5% are predicted to be retained (287 – 292 ft; see Note 6, Table J-4), while woody upland vegetation at elevations with projected future inundation frequencies greater than 5% under the proposed project would be lost (below 287 ft; see Note 13, Table J-4).

R8. Grasslands are predicted to persist where inundation frequencies are 25% or less. Grassland cover was mapped at elevations as low as 279 – 280 ft, which corresponded to an inundation frequency of 25% under current operating conditions. Existing grasslands with projected future inundation frequencies of less than 25% (286 – 292 ft) are predicted to persist (see Note 7, Table J-4).

R9. Grasslands at elevations below the projected 25% inundation frequency are predicted to be converted entirely to wetland vegetation. Existing grasslands with predicted future inundation frequencies greater than 25% (up to 286 ft) under the proposed project are predicted to be lost. Areas currently supporting grasslands have sufficient soil development and water retention capacity to be capable of supporting wetland vegetation. Moreover, grassland cover is generally located on low-slope sites. Thus, all grassland habitats in the zone with a projected inundation frequency greater than 25% (below 286 ft) is predicted to be converted to wetland vegetation (see Note 12, Table J-4).

R10. Slope and inundation frequency determine whether upland habitats are converted to wetland habitats or to lacustrine/unvegetated. Observations during the wetland delineation surveys found that wetland habitats were generally present in areas with inundation frequencies of at least 5% and on slopes of 0 – 8%; steeper slopes often have rocky substrate and insufficient soil development to support wetland vegetation. Therefore, wetland habitats are predicted to form in newly-inundated areas with similar slopes under future with-project conditions. As described in the section on definition of the relevant data set, GIS data indicates that about 50% of the acreage in the affected area is defined as low slope. As a result, half of the acreage currently supporting woody upland vegetation in the elevation range 283 – 287 ft is predicted to develop wetland vegetation, while half is predicted to convert to lacustrine/unvegetated (see Note 13, Table J-4).

R11. The upper limit of wetland vegetation depends on wetland type. The upper limit of herbaceous wetland and riparian vegetation may be determined by hydrology associated with seeps, springs, creeks, and groundwater at elevations above the operating levels, as well as the elevation of reservoir waters themselves. Herbaceous wetland vegetation was found in significant amounts up to 290 ft elevation. Riparian vegetation was present in significant amounts up to 292 ft elevation, and was more abundant above the current average operating elevation than below it. By contrast, the upper limit of the inundation-dependent *Scirpus/Typha* community was distinct at about 283 ft, which corresponded to an inundation frequency of about 5% (see Note 14, Table J-4).

R12. Wetlands may be induced at elevations above the predicted maximum operating elevations, and their proportion is predicted to be similar to that above the current operating elevations. GIS data indicate that within the 5-foot elevation interval above the current maximum operating elevation (283 – 288 ft), wetland cover types occupy 51 acres in the 108 acres found in the elevation range, or about 47% of the total acreage. The wetland habitat here is supported by groundwater, seeps, and stream discharge into the reservoir, as well as proximity to the reservoir itself. Since groundwater, seeps and stream discharge features will rise under the proposed project because of increased operating elevations, it is predicted that some wetland habitat will form at commensurately higher elevations under future with-project conditions. In the 5-ft elevation range 287 – 292 ft above the proposed future maximum operating elevation, wetland vegetation currently occupies only 30 acres out of a total of 111 acres, or 28% of acreage. If wetlands are predicted to form proportional to the extent of wetlands in the interval above the current operating maximum, an additional approximately 22 acres of wetlands are predicted to form in what is currently 83 acres of uplands. Conservatively, 25% of uplands (both woody and grasslands) in the elevation range 287 – 290 ft are predicted to be converted to form 20.8 acres of induced wetlands under the proposed project (see Notes 15 and 16, Table J-4).

References

Briggs, David A. and Cameron, David S., Water Supply & Treatment Division Interoffice Memorandum regarding Operating Range of Crystal Springs Reservoir, Comparison of Observed and Modeled Data, and Refinement of HH/LSM Output for Crystal Springs Reservoir Storage and Elevation, May 8, 2009

Cowardin, L. M., V. Carter, F. Golet, and E. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States. Washington, DC: US Department of the Interior, US Fish and Wildlife Service.

Entrix, Inc. 2006. Lower Crystal Springs Dam Improvements Project, Biological Resources Technical Report. Unpublished report prepared for the San Francisco Public Utilities Commission, October 2006.

Entrix, Inc./MSE Joint Venture (Entrix/MSE) 2007. Lower Crystal Springs Dam Improvements Project, San Mateo County, California, Wetlands Determination Report. Prepared for the San Francisco Public Utilities Commission. December.

Holland, R. F. 1986. Preliminary descriptions of the terrestrial natural communities of California. State of California, The Resources Agency, Nongame Heritage Program, Department of Fish and Game, Sacramento, California. 156pp.

Steiner, Daniel B., Memorandum on Lower Crystal Springs Dam Improvement Project Variant Operation, January 25, 2009

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Table 1: Summary of Raw GIS vegetation mapping data, by one-foot elevation increments

Elevation interval (ft)	**Vegetation/ Land cover (in acres)**													
	Coast live oak forest	Coastal sage scrub	Fluctuation Zone/ Lacustrine	Non-native grassland	Non-native woodland	Northern mixed chaparral	Open water	Riparian	Scirpus/ Typha	Herbaceous wetland	Developed land	Mixed evergreen forest	**TOTAL**	Area not attributed to cover type
294-295	0.0032			0.0084							0.001	0.1277	0.1403	63.5023
293-294	0.0033			0.0114				0.0000			0.0011	0.1523	0.1681	24.3915
292-293	0.0035	0.0000		0.0099				0.0001			0.0014	0.1629	0.1778	25.5590
291-292	3.1522	1.5095		1.0718	0.3061	0.0522	0.0140	1.2193	0.0001	0.1616	0.0266	2.2524	9.7658	13.8141
290-291	7.0714	3.7038		1.9769	1.3080	0.0526	0.0201	4.4487	0.0005	0.7723	0.0603	2.6975	22.1121	0.8627
289-290	6.2218	4.0981		2.0552	1.0465	0.0390	0.0229	4.8237	0.0009	1.2675	0.0534	2.5519	22.1809	0.7301
288-289	5.1647	3.8055		1.9875	0.8213	0.0338	0.0293	5.2406	0.0023	2.3896	0.0660	2.3461	21.8867	0.4597
287-288	4.6723	3.3601		2.1002	0.5174	0.0337	0.0382	6.4749	0.0284	1.9297	0.1090	2.1154	21.3793	0.4423
286-287	3.8510	3.0411	0.0001	2.2657	0.4815	0.0360	0.0493	7.4190	0.0460	1.5775	0.0804	1.9943	20.8419	0.4549
285-286	2.9841	2.8689	0.0011	2.8933	0.2493	0.0325	0.0698	8.4997	0.0579	1.6603	0.0509	1.9342	21.302	0.4739
284-285	2.4404	2.2569	0.0023	3.3947	0.1780	0.0251	0.1037	8.0228	0.3037	2.0444	0.0425	1.9350	20.7495	0.5064
283-284	0.8734	1.2028	0.3921	4.9343	0.0783	0.0069	3.6556	8.2165	0.3588	4.0425	0.0190	0.6332	24.4134	0.5943
282-283	0.0237	0.1336	0.2792	3.0448	0.0076		2.0564	6.8193	1.4616	6.1142	0.0058	0.0167	19.9629	0.2975
281-282	0.0095	0.0494	0.2863	2.0480	0.0051		3.2778	5.1276	1.8694	9.3615	0.0112	0.1342	22.18	0.4249
280-281	0.0016	0.0310	0.2181	1.0529	0.0043		3.2684	3.8409	2.7834	10.4235	0.0089	0.0563	21.6893	0.3820
279-280		0.0091	0.1567	0.6697	0.0037		3.4742	2.8041	2.8331	12.0538	0.0052	0.0161	22.0257	0.3778
278-279		0.0068	0.1597	0.3947	0.0024		3.4903	2.2340	2.0849	13.1536	0.0044	0.0099	21.5407	0.3585
277-278		0.0018	0.1449	0.1715	0.0017		3.6981	2.1690	1.7429	11.7205	0.0040	0.0082	19.6626	0.3618
276-277			0.1686	0.1037	0.0013		3.6880	1.6868	1.5267	11.4502	0.0037	0.0072	18.6362	0.3517
275-276	0.0004		0.1692	0.0665	0.0004		3.7804	1.0998	1.2088	11.9168	0.0035	0.0062	18.252	0.3536
274-275	0.0024		0.1715	0.0498	0.0000		3.9610	0.5461	0.9573	12.4694	0.0036	0.0057	18.1668	0.3531
273-274	0.0032		0.1674	0.0478			4.2267	0.3062	0.7789	12.1360	0.0036	0.0057	17.6755	0.3498
272-273	0.0032		0.1574	0.0500			4.3007	0.2270	0.9483	12.1406	0.0036	0.0058	17.8366	0.3564
271-272	0.0011		0.1566	0.0497			4.5318	0.1937	1.2689	10.4520	0.0037	0.0061	16.6636	0.3499
270-271	0.0003		0.1700	0.0521			4.7095	0.1562	0.7711	10.3838	0.0036	0.0063	16.2529	0.3493
269-270	0.0002		0.1429	0.0537			4.9935	0.1472	0.4873	11.8824	0.0035	0.0062	17.7169	0.3488
268-269	0.0002		0.1143	0.0558			5.4585	0.1647	0.2960	11.7596	0.0033	0.0056	17.858	0.3523
267-268	0.0001		0.0524	0.0606			6.7241	0.1998	0.2276	10.8331	0.0035	0.0118	18.113	0.3472
266-267			0.0606	0.0354			8.4006	0.2192	0.1596	9.8452	0.0039	0.0162	18.7407	0.3440
265-266			0.0708	0.0223			9.6260	0.1958	0.1163	10.5269	0.0038	0.0185	20.5804	0.3426
264-265			0.0887	0.0106			11.4037	0.0794	0.0802	8.2982	0.0036	0.0164	19.9808	0.3408
263-264			0.5871				12.9413	0.0098	0.0512	4.2713	0.0044	0.0123	17.8774	0.3418
262-263			0.8205				12.3777	0.0091	0.0402	2.1786	0.0067	0.0072	15.44	0.3377
261-262			0.7275				13.3980	0.0088	0.0219	1.0823	0.0069	0.0052	15.2506	0.3337
260-261			0.145				13.6976	0.0088	0.0046	0.5428	0.0053	0.0051	14.4092	0.3353
0-260			0.2128				860.851	1.1964	0.0005	0.6685	2.7926	2.1836	867.9054	37.1144
TOTAL:	36.4872	26.0784	5.8238	30.7489	5.0129	0.3118	1012.3382	83.815	22.5193	231.5102	3.4139	21.4754	**1479.535**	176.9961

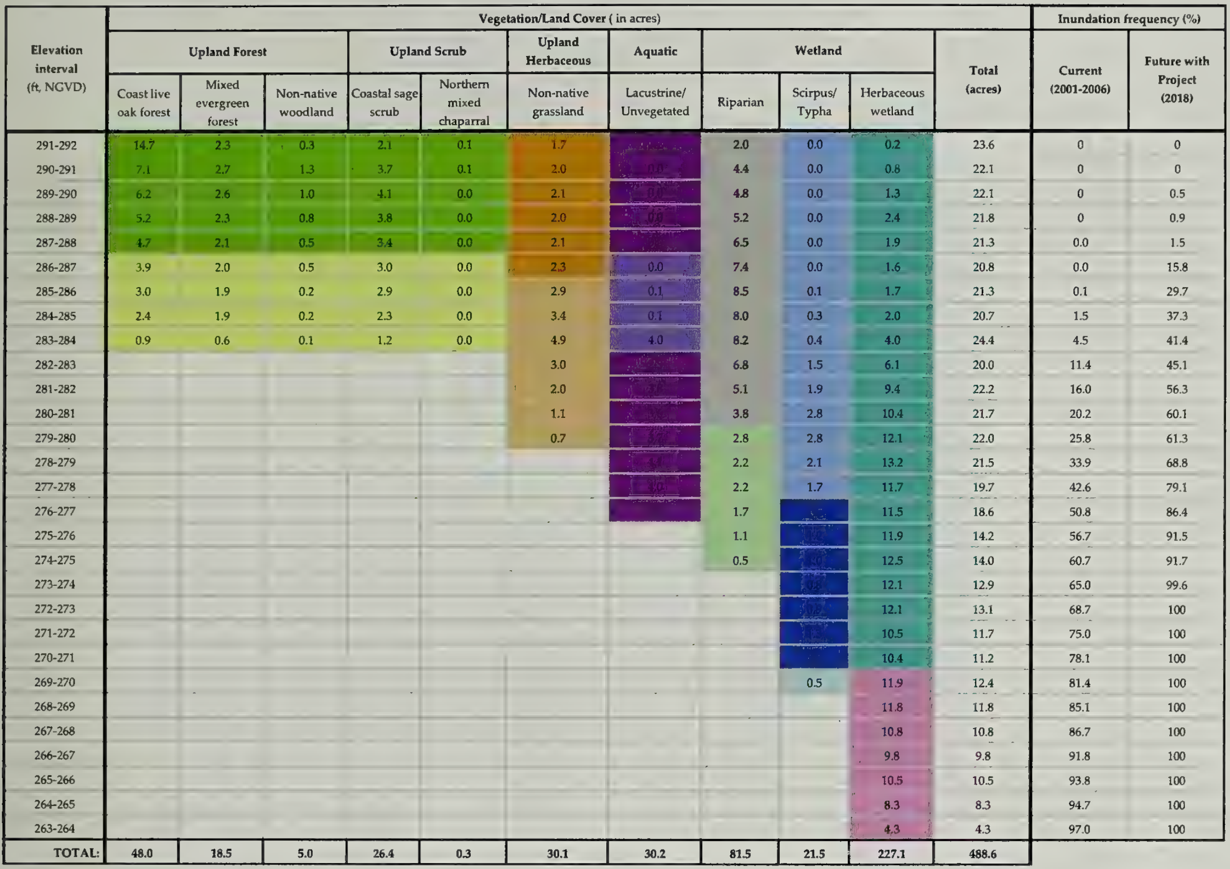
▨ Indicates data not relevant to analysis of proposed future reservoir operations

Table 2: Vegetation/Land Cover Data for LCSDI Impact Analysis of Increased Operating Levels

Elevation interval (ft, NGVD)	Vegetation/ Land cover (in acres)										
	Upland Forest			Upland Scrub		Upland Herbaceous	Aquatic	Wetland			TOTAL
	Coast live oak forest	Mixed evergreen forest	Non-native woodland	Coastal sage scrub	Northern mixed chaparral	Non-native grassland	Lacustrine/ Unvegetated	Riparian	Scirpus/ Typha	Herbaceous wetland	
291-292 [a]	14.7	2.3	0.3	2.1	0.1	1.7	0.2	2.0	0.0	0.2	23.6
290-291	7.1	2.7	1.3	3.7	0.1	2.0	0.0	4.4	0.0	0.8	22.1
289-290	6.2	2.6	1.0	4.1	0.0	2.1	0.0	4.8	0.0	1.3	22.1
288-289	5.2	2.3	0.8	3.8	0.0	2.0	0.0	5.2	0.0	2.4	21.8
287-288	4.7	2.1	0.5	3.4	0.0	2.1	0.0	6.5	0.0	1.9	21.3
286-287	3.9	2.0	0.5	3.0	0.0	2.3	0.0	7.4	0.0	1.6	20.8
285-286	3.0	1.9	0.2	2.9	0.0	2.9	0.1	8.5	0.1	1.7	21.3
284-285	2.4	1.9	0.2	2.3	0.0	3.4	0.1	8.0	0.3	2.0	20.7
283-284	0.9	0.6	0.1	1.2	0.0	4.9	4.0	8.2	0.4	4.0	24.4
282-283						3.0	2.5	6.8	1.5	6.1	20.0
281-282						2.0	3.8	5.1	1.9	9.4	22.2
280-281						1.1	3.6	3.8	2.8	10.4	21.7
279-280						0.7	3.7	2.8	2.8	12.1	22.0
278-279							4.1	2.2	2.1	13.2	21.5
277-278							4.0	2.2	1.7	11.7	19.7
276-277							4.0	1.7	1.5	11.5	18.6
275-276								1.1	1.2	11.9	14.2
274-275								0.5	1.0	12.5	14.0
273-274									0.8	12.1	12.9
272-273									0.9	12.1	13.1
271-272									1.3	10.5	11.7
270-271									0.8	10.4	11.2
269-270									0.5	11.9	12.4
268-269										11.8	11.8
267-268										10.8	10.8
266-267										9.8	9.8
265-266										10.5	10.5
264-265										8.3	8.3
263-264										4.3	4.3
TOTAL:	48.0	18.5	5.0	26.4	0.3	30.1	30.2	81.5	21.5	227.1	488.6

[a] The acreages of vegetation/land cover in the 291-292-foot contour interval were adjusted to incorporate 13.8 acres of area not attributed to cover type in the raw data presented in Table 1. The vegetation of this acreage was estimated using the GIS data for the mapped vegetation type in adjacent polygons, and the acreages were assigned to the vegetation type with the longest shared border.

Table 3. Vegetation Types by Elevation Compared to Current and Future-with-Project Inundation Frequencies



Elevation interval (ft, NGVD)	Vegetation/Land Cover (in acres)											Inundation frequency (%)	
	Upland Forest			**Upland Scrub**		**Upland Herbaceous**	**Aquatic**	**Wetland**			**Total (acres)**	**Current (2001-2006)**	**Future with Project (2018)**
	Coast live oak forest	Mixed evergreen forest	Non-native woodland	Coastal sage scrub	Northern mixed chaparral	Non-native grassland	Lacustrine/ Unvegetated	Riparian	Scirpus/ Typha	Herbaceous wetland			
291-292	14.7	2.3	0.3	2.1	0.1	1.7	[illegible]	2.0	0.0	0.2	23.6	0	0
290-291	7.1	2.7	1.3	3.7	0.1	2.0	0.0	4.4	0.0	0.8	22.1	0	0
289-290	6.2	2.6	1.0	4.1	0.0	2.1	0.0	4.8	0.0	1.3	22.1	0	0.5
288-289	5.2	2.3	0.8	3.8	0.0	2.0	0.0	5.2	0.0	2.4	21.8	0	0.9
287-288	4.7	2.1	0.5	3.4	0.0	2.1	[illegible]	6.5	0.0	1.9	21.3	0.0	1.5
286-287	3.9	2.0	0.5	3.0	0.0	2.3	0.0	7.4	0.0	1.6	20.8	0.0	15.8
285-286	3.0	1.9	0.2	2.9	0.0	2.9	0.1	8.5	0.1	1.7	21.3	0.1	29.7
284-285	2.4	1.9	0.2	2.3	0.0	3.4	0.1	8.0	0.3	2.0	20.7	1.5	37.3
283-284	0.9	0.6	0.1	1.2	0.0	4.9	4.0	8.2	0.4	4.0	24.4	4.5	41.4
282-283						3.0	[illegible]	6.8	1.5	6.1	20.0	11.4	45.1
281-282						2.0	3.0	5.1	1.9	9.4	22.2	16.0	56.3
280-281						1.1	[illegible]	3.8	2.8	10.4	21.7	20.2	60.1
279-280						0.7	3.7	2.8	2.8	12.1	22.0	25.8	61.3
278-279							4.1	2.2	2.1	13.2	21.5	33.9	68.8
277-278							4.0	2.2	1.7	11.7	19.7	42.6	79.1
276-277							[illegible]	1.7	[illegible]	11.5	18.6	50.8	86.4
275-276								1.1	0.2	11.9	14.2	56.7	91.5
274-275								0.5	1.0	12.5	14.0	60.7	91.7
273-274									0.8	12.1	12.9	65.0	99.6
272-273									0.9	12.1	13.1	68.7	100
271-272									1.3	10.5	11.7	75.0	100
270-271									[illegible]	10.4	11.2	78.1	100
269-270									0.5	11.9	12.4	81.4	100
268-269										11.8	11.8	85.1	100
267-268										10.8	10.8	86.7	100
266-267										9.8	9.8	91.8	100
265-266										10.5	10.5	93.8	100
264-265										8.3	8.3	94.7	100
263-264										4.3	4.3	97.0	100
TOTAL:	48.0	18.5	5.0	26.4	0.3	30.1	30.2	81.5	21.5	227.1	488.6		

PREDICTED CHANGES TO VEGETATION (AC)

71.1	Upland woody vegetation, predicted to remain as upland habitat, although may convert to other upland types such as grassland
27.1	Upland woody vegetation predicted to be converted to wetland (50%) and open water (50%)
12.1	Grassland, predicted to remain as grassland
18.0	Grassland, predicted to be converted to wetlands
4.3	Lacustrine/unvegetated, predicted to be converted to wetland (50%) and remain as lacustrine/unvegetated (50%)
■	Lacustrine/unvegetated, predicted to remain as lacustrine/unvegetated
70.9	Riparian, predicted to remain as riparian
10.5	Riparian, predicted to be converted to other wetlands
13.6	*Scirpus/Typha* , predicted to remain as *Scirpus/Typha*
■	*Scirpus/Typha* , predicted to be converted to other wetlands
0.5	*Scirpus/Typha* , predicted to be converted to open water
159.7	Herbaceous wetland, predicted to remain as herbaceous wetland
67.4	Herbaceous wetland, predicted to be converted to open water

Note: The inundation frequency data are from Table 5.12-3 and represent the percentage of time in a given year that a perimeter contour would be inundated. Current inundation frequencies represent historical daily data for the 60-month period from July 2001 to July 2006. Future with project inundation frequencies represent modeled data over the 984-month period from July 1920 to September 2002 based on monthly time steps, with adjustments to account for Crystal Spring Reservoir daily operating patterns.

Table 4: Summary of Predicted Impacts On Vegetation Due to Increased Normal Maximum Operating Levels

Status	Vegetation/Land cover (acres)											Notes
	Upland Forest			Upland Scrub		Upland Herbaceous	Aquatic	Wetland			Total (acres)	
	Coast live oak forest	Mixed evergreen forest	Non-native woodland	Coastal sage scrub	Northern mixed chaparral	Grassland	Lacustrine/ Unvegetated	Riparian	*Scirpus/ Typha*	Herbaceous wetland		
Existing	48.0	18.5	5.0	26.4	0.3	30.1	30.2	81.5	21.5	227.1	488.6	1. Habitat between 263 -292 ft is subject to changes in inundation frequency resulting from increased operating elevations Total – 488.6 acres. See R1 in text.
No Changes Predicted								70.9			70.9	2. Riparian cover above 279 ft will persist because inundation frequency will remain less than 61%. See R2 in text.
									13.6		13.6	3. *Scirpus/Typha* above 277 ft will persist because inundation frequency will remain less than 81%. See R3 in text.
										159.7	159.7	4. Herbaceous wetland above 270 ft will persist because it is within 12 feet of future average operating level. See R5 in text.
							28.1				28.1	5. Lacustrine/unvegetated between 276 – 292 ft will persist as lacustrine/unvegetated, except where inundation frequencies rise from below 5% to above 5% (4.3 ac in 283-287 ft). In this area, low slope areas (50% or 2.2 ac) are predicted to convert to wetland, while high slope areas (50% or 2.1 ac) will remain as lacustrine/unvegetated See R6 in text; see Note 14 for other 50% of this acreage).
	53.3										53.3	6. Most woody upland vegetation between 287-292 ft will persist because inundation frequencies are predicted to remain <5%, but species composition may change (assume 75% of total 67.0 acres in this range). See R7, see also Note 15 for the other 25% of this acreage.
						9.1					9.1	7. Existing grasslands are found at elevations with up to 25% inundation frequency. Grasslands at elevations between 286-292 ft are predicted to persist because inundation frequency will be no more than 25%. See R8 in text.
Direct changes due to increase in maximum normal operating level								-7.7		7.7	0.0	8. Riparian cover between 274-278 ft will convert to other wetland due to increase in inundation frequency >61%. See R2 in text
									-7.5	7.5	0.0	9. *Scirpus/Typha* between 270-277 ft will convert to other wetland where inundation frequency increases to >81% and depth is less than 12 ft below future average operating elevation. See R3 and R4 in text
							0.5		-0.5		0.0	10. *Scirpus/ Typha* below 270 ft will convert to lacustrine/unvegetated because it will be more than 12 ft below the average operating level. See R3 and R5 in text.
							67.4			-67.4	0.0	11. Herbaceous wetland below 270 ft is predicted to be converted to lacustrine/unvegetated because it will be more than 12 ft below the average operating level. See R5 in text.
						-18.0				18.0	0.0	12. Grasslands between 279 - 286 ft are predicted to be converted to seasonal wetland due to predicted inundation frequency greater than 25%. See R9 in text.
	-10.1	-6.5	-1	-9.4	-0.1		13.6			13.5	0.0	13. Woody upland vegetation between 283 – 287 ft is predicted to be inundated > 5% of the time and therefore would not persist. Assume 50% will convert to wetland in low slope areas and 50% will convert to lacustrine/ unvegetated in high slope areas. See R10 in text.
							-2.2			2.2	0.0	14. Some lacustrine/unvegetated habitat between 283 – 287 ft will convert to wetland in low slope area because of increased inundation frequencies (assume 50% of total 4.3 acres). See R6 and R11 in text; see Note 5 for other 50% of this acreage.
Indirect changes due to induced wetland conditions	-9.5	-3.0	-1.0	-4.3	-0.1					17.8	0.0	15. Some woody upland vegetation between 287-292 ft will convert partially (25%) to wetland due to induced wetland conditions. See R12 in text; see Note 6 for other 75% of this acreage.
						-3.0				3.0	0.0	16. Some grassland between 286 -292 ft will convert partially (25%) to wetlands due to induced wetland conditions. See R12 in text; see Note 7 for other 75% of this acreage.
Final, post-project, acreage	28.4	9.0	3.0	12.8	0.2	9.1	109.5	73.8	13.5	229.3	488.6	Total Acres = 488.6
Net change from existing acreage	-19.6	-9.5	-2.0	-13.7	-0.2	-21.0	79.4	-7.7	-8.0	2.3	0.0	Net change Upland Forest: -31.1 acres Net change Upland Scrub: -13.8 acres Net change Grassland: -21.0 acres Net change Wetland: -13.5 acres

APPENDIX K

Fish Habitat Surveys for LCSDI

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FINAL

Upper and Lower San Mateo and Laguna Creeks Fish Habitat Surveys

For the proposed

Lower Crystal Springs Dam Improvements Project

prepared for

The San Francisco
Public Utilities Commission
and the San Francisco Planning Department
Major Environmental Analysis Division

prepared by

ENTRIX, Inc. / MSE Joint Venture

August 2009

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SUMMARY

This report provides the fish, habitat and population surveys conducted to establish baseline aquatic resource conditions within the Crystal Springs Reservoir Watershed operated by San Francisco Public Utilities Commission (SFPUC) and in Lower San Mateo Creek. The surveys were conducted as part of the proposed Lower Crystal Springs Dam (LCSD) Improvements Project (Project). This Project involves modifications to the spillway at LCSD to safely pass the Probable Maximum Flood (PMF)[1] and result in restoring reservoir operations to the former maximum water surface elevation and storage capacity within Crystal Springs Reservoir. Under current Division of Safety of Dams (DSOD) rules, the reservoir is limited to a maximum elevation of 283.8 feet (NGVD[2]). The present proposed Project would operate the reservoir to an elevation of 287.8 feet with temporary maximum permissible storage to an elevation of 291.8 feet for up to two weeks to capture peak flows in winter. This report was prepared when there was a proposed Project to operate the reservoir to an elevation of 291.8 feet and a Project Variant would operate the reservoir to 287.8 feet. Except for updating the description of the Project in this paragraph, the remainder of the report still retains the terminology of the Project and Project Variant. Impact assessments and conclusions are still consistent with the operating levels so defined.

Potential Effects of the Project occur upstream of the reservoir where operations may increase water levels along tributary streams altering habitat in the inundated channels. An increase of the reservoir's maximum storage elevation would lead to the seasonal inundation of sections of the Upper San Mateo and Laguna creeks thus converting existing creek channels into reservoir habitat. Fishery habitat surveys were completed to document the habitat within the creeks at elevations upstream of 283.8 feet and to provide information on the quantity and quality of creek habitat that would be converted into reservoir habitat under the proposed Project and Project Variant. Aquatic habitat surveys were performed on 6,897 feet of San Mateo Creek upstream of Lower Crystal Springs Reservoir from the confluence of the diversion channel from Stone Dam with San Mateo Creek to the road crossing below Mud Dam No. 2. A habitat assessment was conducted on the Laguna Creek watershed.

Potential Effects of the Project occur downstream of the reservoir where the construction would effect riparian and aquatic habitat in Lower San Mateo Creek. Surveys were conducted in San Mateo Creek downstream of LCSD because modifications to the spillway and installation of a stilling basin at the base of the dam would eliminate or alter riparian woodland habitat and aquatic habitat in Lower San Mateo Creek immediately below the dam and construction impacts could potentially temporarily affect habitat in Lower San Mateo Creek. Habitat surveys were conducted on 3,757 feet of Lower San Mateo Creek between the intersection of Crystal Springs and Polhemus roads to upstream of the Interstate 280 (I-280) abutment, at which point, the natural creek was clearly altered by highway structures and dam facilities. Finally, a reconnaissance-level survey was conducted on Lower San Mateo Creek between the dam and tidewater located just east of Highway 101. During the fall of 2008, SFPUC biologists electrofished four sites in lower San Mateo Creek to develop quantitative data on the fish population in the creek. This report describes the survey methodology and results from these different surveys and discusses the results.

---

[1] Probable Maximum Flood (PMF) is the largest flood that may reasonably be expected to occur from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible on the watershed.

[2] The National Geodetic Vertical Datum of 1929: A vertical control datum established for vertical control in the United States by the general adjustment of 1929.

The objectives of these surveys were to:

- Map and quantify aquatic habitat in Upper San Mateo Creek that is available to rainbow trout from the reservoir including habitat within the channel segments that may become inundated by operations under the proposed Project and Project Variant.
- Map, and quantify accessible potential rainbow trout spawning habitat throughout accessible portions of Upper San Mateo Creek.
- Document aquatic habitat conditions in Laguna Creek available to trout from the reservoir including habitat within the channel segments that may become inundated by operations under the proposed Project and Project Variant.
- Assess the Laguna Creek system for rainbow trout habitat including channel segments that provide potential spawning habitat and any rearing habitat.
- Determine the amount and type of aquatic habitat would be potentially lost to operations under the proposed Project and Project Variant compared to operations under existing conditions.
- Map and quantify aquatic habitat in Lower San Mateo Creek between the dam and the confluence with Polhemus Creek that may be available to support Central California Coast steelhead trout from South San Francisco Bay for migration, spawning and rearing.
- Determine the amount and type of aquatic habitat would be potentially lost to construction compared to existing conditions.
- Assess the habitat conditions throughout Lower San Mateo Creek that potentially supports salmonids and determine if migration barriers exists for anadromous salmonids.

1.0 INTRODUCTION

Crystal Springs Reservoir is located approximately 12 miles south of the city of San Francisco and receives runoff from a 35 square-mile area (Figure 1.1) of the Santa Cruz Mountains in San Mateo County California. San Mateo Creek was dammed in the late 1890s to provide water storage for the San Francisco region creating Crystal Springs Reservoir. The reservoir is divided into two bodies by an older dam that supports State Route 92 (SR 92). The reservoir to the south of SR 92 is Upper Crystal Springs Reservoir (UCSR) and to the north is Lower Crystal Springs Reservoir (LCSR). The two reservoirs are connected and operated as a single reservoir. Presumably, fish can also move between the two reservoirs.

The primary tributary of LCSR is San Mateo Creek. Several small, steep and short water courses provide runoff to LCSR during storms but do not sustain stream flows after storms to support fisheries. San Mateo Creek is likely to be the only spawning stream tributary to the LCSR. Some spawning may occur in the short channel that delivers water via a tunnel from Stone Dam. The amount of spawning habitat available in the Stone Dam channel depends on the reservoir water surface elevation under existing operations during the spring spawning period. High water levels would inundate all potential spawning habitat in this channel.

San Mateo Creek sustains perennial surface flows upstream of the reservoir influence in most years based on observed flows in late summer of Water Year 2006-2007, a Dry Year. Fish species encountered in upper San Mateo Creek include rainbow trout (*Oncorhynchus mykiss*) and prickly sculpin (*Cottus asper*). At least one California red-legged frog (*Rana aurora draytonii*) was also observed during the August 2007 habitat survey.

The main tributary to UCSR is Laguna Creek that enters the reservoir near the Pulgas Water Temple. The Laguna Creek system is a seasonal creek for the most part. It is contained within a small watershed measuring about 2.1 miles along the creek axis by 3.7 miles wide upstream of the reservoir. The watershed is oriented parallel to San Andreas Fault, trending northwest to southeast and the drainage pattern appears strongly influenced by faulting. Laguna and Fault creeks parallel each other on either side of the fault valley. Both streams have very low gradients with substrates that transition from sand and clay near the reservoir to gravel and cobble near the upper end of the watershed. The Laguna Creek system is the only tributary that would support spawning runs of rainbow trout from Upper Crystal Springs Reservoir. Based on observations during this survey, Laguna Creek does not sustain year-round flows in most years. A short reach of one of its tributaries, Spring Creek, does sustain year-round surface water in most years. However, this reach is upstream of a passage barrier is not presently accessible to fish from the reservoir.

Spring Creek drains the hills to the west of the San Andreas Fault. The creek is very steep immediately west of the fault valley with substrates of boulder and cobble. Spring Creek reservoir, a small water supply reservoir on the Filoli property is located upstream of a very steep section of channel that would naturally impede upstream fish access. Spring Creek is perennial from downstream of the reservoir to where the creek intersects with the edge of the valley and is ephemeral between the valley edge and the confluence with Laguna Creek.

San Mateo Creek downstream of Crystal Springs Dam (Lower San Mateo Creek) supports both native and introduced fish species. Juvenile rainbow trout/Central California Coast ESU steelhead, Sacramento sucker *Catostomus occidentalis*), threespine stickleback (*Gasterosteus aculeatus*), prickly sculpin, (*Cottus asper*) and mosquitofish (*Gambusia affinis*) occur in Lower San Mateo Creek (ESA 1994 and this study). Several large non-native carp (*Cyprinus carpio*) were observed in pools immediately below the dam during the May 10, 2007 site visit. Rainbow trout/steelhead, Sacramento suckers and threespine stickleback, were observed throughout most of the creek sites visited during the August 5, 2008 site visit.

Streamflow in Lower San Mateo Creek is sustained by seepage around the LCSD base, leakage of water from the valves between the LCSD and San Mateo Creek, and from downstream accretion or tributary inflow. During the August 5, 2008 site visit the flow in Lower San Mateo Creek at the upstream temporary gaging site was estimated at about 0.6 cfs. About 3 miles downstream near the intersection of Crystal Springs and El Cerrito roads, the flow in the creek was estimated at about 2 to 3 cfs. This volume of flow was sustained to where the creek entered the section beneath the City of San Mateo, just east of the El Camino Real. Stream flow had declined to about 1 cfs after emerging from the channel beneath downtown San Mateo near the San Mateo Caltrain Station to tidewater just west of Highway 101.

The San Mateo and Laguna Creeks Habitat Assessments were conducted to evaluate potential impacts from the proposed Project and the Project Variant. Under existing conditions the reservoir is operated to a maximum water surface storage elevation of 283.8 feet. Under the proposed Project the reservoir would be operated to the historic storage elevation of 291.8 feet, an eight-foot increase over the current maximum operational storage elevation. Under the Project Variant the reservoir would be operated to a maximum operating storage elevation of 287.8, or four feet higher than the existing storage elevation. Either alternative would inundate some amount of stream habitat upstream upstream of the existing reservoir.

Dam and spillway modifications and the installation of a stilling basin at the base of the LCSD would be required to safely pass the PMF. Construction activities and the footprint of the stilling basin would permanently and temporarily eliminate aquatic habitat in the upper discharge pool in Lower San Mateo Creek.

San Mateo Creek sustains permanent surface flows both up and downstream of the reservoir and the objective of the habitat typing survey is to document and map aquatic habitat conditions present within Upper San Mateo Creek and a portion of Lower San Mateo Creek. Laguna Creek does not sustain year round surface flows and the duration and extent of the flow in Laguna Creek is dependent on the water year type. General habitat conditions in the creek were unknown prior to this survey. The objective of the habitat assessment of Laguna Creek is to document the presence of potential spawning habitat and, in linear feet of channel and the location of the channel segments that supports potential spawning habitat. This information provides the baseline to assess the effects of operations under the proposed Project or Project Variant relative to existing conditions. This restoration of operation to the historic maximum operational storage level would result in a seasonal change from stream habitat to reservoir habitat upstream of the present operational storage maximum of 283.8 feet.

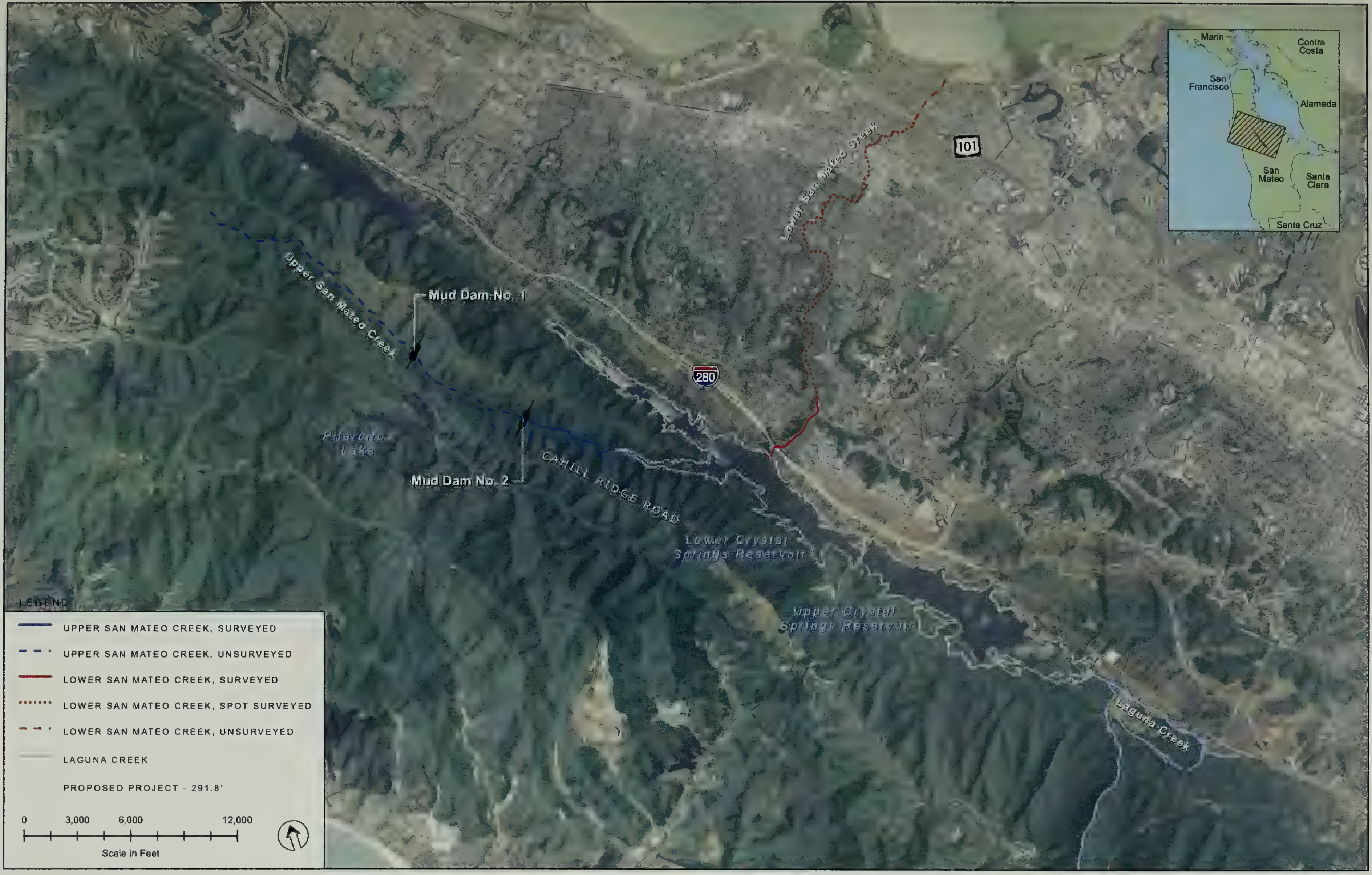
Marin
Contra Costa
San Francisco
Alameda
San Mateo
Santa Clara
Santa Cruz
101
280
Lower San Mateo Creek
Upper San Mateo Creek
Mud Dam No. 1
Mud Dam No. 2
Pilarcitos Lake
CAHILL RIDGE ROAD
Lower Crystal Springs Reservoir
Upper Crystal Springs Reservoir
Laguna Creek
LEGEND
UPPER SAN MATEO CREEK, SURVEYED
UPPER SAN MATEO CREEK, UNSURVEYED
LOWER SAN MATEO CREEK, SURVEYED
LOWER SAN MATEO CREEK, SPOT SURVEYED
LOWER SAN MATEO CREEK, UNSURVEYED
LAGUNA CREEK
PROPOSED PROJECT - 291.8'
0
3,000
6,000
12,000
Scale in Feet

Figure 1.1
San Mateo Creek and Laguna Creek Aquatic Habitat Assessment Study Area

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Potentially, rainbow trout spawning habitat could be lost to inundation during the trout spawning season (approximately February to April) resulting from operating the reservoir to a higher water surface elevation.

The habitat survey mapped and quantified potential spawning habitat in Upper San Mateo Creek to evaluate the effect of the potential loss of spawning habitat within the fluctuation zone relative to available spawning habitat in San Mateo Creek. The fluctuation zone was also assessed with regard to migration conditions for trout fry from their rearing habitat in the creek to the reservoir that occurs in the spring as discharge declines and the reservoir is drawn down.

A different approach was used on the Laguna Creek system because it does not provide year round rearing habitat. General channel conditions were assessed for potential spawning habitat and the location of channel segments that could provide potential spawning habitat was mapped.

Habitat typing in San Mateo Creek between the dam and Polhemus Creek documented habitat conditions that may potentially support migration and spawning of adult steelhead and incubation and rearing of fry and older steelhead in close proximity to the dam. Some of this habitat may be affected by the proposed installation of the stilling basin at the base of the LCSD. The reconnaissance survey of Lower San Mateo Creek was conducted to examine the creek for obvious migration barriers and to document general habitat conditions. A fish survey was conducted by SFPUC biologist to document fish populations in this urbanized stream.

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2.0 STUDY AREA

Aquatic habitat surveys were conducted on two sections of San Mateo Creek, one upstream and the other downstream of LCSR and an assessment of habitat conditions was conducted on Laguna Creek upstream of UCSR (Figure 1.1). Upper San Mateo Creek provides spawning and year-round rearing habitat for reservoir-dwelling rainbow trout. Laguna Creek provides spawning and early fry rearing habitat, but does not support year-round rearing for rainbow trout. Lower San Mateo Creek provides potential migration, spawning and rearing habitat for Central California Coast ESU steelhead that may access the creek from South San Francisco Bay, and also provides year round habitat for rainbow trout and several native fishes throughout the creek at least upstream from El Camino Real.

Upper San Mateo Creek drains the slopes to the northwest of the LCSR. A system of tunnels can divert Pilarcitos Creek water, a coastal stream located west of the San Mateo Creek watershed into San Mateo Creek. Water can be diverted from Pilarcitos Reservoir to Mud Dam No. 1, located about three miles upstream of LCSR on San Mateo Creek, where it can either be released down the creek or delivered to San Andreas Reservoir. Water that flows down San Mateo Creek from Mud Dam No. 1 is intercepted at Mud Dam No. 2 located about 1.5 miles upstream of Lower Crystal Springs Reservoir, where it can be released downstream in San Mateo Creek or re-diverted into the north arm of Lower Crystal Springs Reservoir or taken into a pipeline connecting Lower Crystal Springs Reservoir with San Andreas Reservoir.

Water released past Mud Dam No. 2 into San Mateo Creek flows for more than a mile before reaching Lower Crystal Springs Reservoir in the San Mateo Creek arm. Several tributaries contribute surface flows to San Mateo Creek between Mud Dam No. 2 and the reservoir.

A second diversion from Pilarcitos Creek located at Stone Dam delivers water into the San Mateo Creek arm of the reservoir within the Existing Inundation Zone.

Previous surveys (Leidy 2002) in March 1988 found juvenile rainbow trout (90-130 millimeters) rearing in San Mateo Creek just upstream of the reservoir. A 1991 survey confirmed rainbow trout presence within the creek just downstream of Mud Dam No. 2 (Smith 1991). In the same report, Smith noted that the watershed lands around Crystal Springs Reservoir have been protected over a long period of time, offering the potential for retaining important native fish populations.

Aquatic habitat was evaluated in Upper San Mateo Creek from the confluence of the Stone Dam diversion channel up to the road crossing below Mud Dam No. 2 (Figure 2.1). Habitat typing occurred for a total distance of 6,897 feet extending from about the 288 foot elevation in the Existing Inundation Zone upstream about 475 foot elevation below the road crossing near Mud Dam #2. The road crossing is a complete barrier to upstream fish passage but no barriers are present between the road and the reservoir. Two distinct reaches were identified within Upper San Mateo Creek; the Inundation Reach from about 272 feet elevation to about 292 feet and the Canyon Reach, from the 292 foot elevation to the unnamed road below Mud Dam No. 2.

The lower 2,179 feet (about 0.4 mile) of San Mateo Creek extends through the Existing Inundation Zone of the reservoir from about the 275 foot elevation to the lower end of the Potential Inundation Zone (Inundation Reach) at about the 288 foot elevation to the historic maximum water surface elevation channel at about 292 foot elevation. The most downstream section of the Existing Inundation Zone (1,088 feet within the existing fluctuation zone of the reservoir) has a valley bottom ranging from 70-200 feet wide that has been created from over a century of sediment deposition in a zone where the creek enters the reservoir. Part of this section was habitat mapped because it was not possible to identify elevations in the field between the Existing and Potential Inundation Zones and therefore not possible to demark the lower end of the Inundation Reach for the purposes of the study in the field. We identified locations through the combined use of GPS waypoints and habitat mapping distances using GIS, we then eliminated the unnecessary mapping components in the analysis and write u since the Existing Inundation Zone is already under the influenced by reservoir operations and habitat effects in this zone are not an issue for the Project or Project Variant.

The length of the Potential Inundation Zone (hereafter referred to as the Inundation Reach) above the Existing Inundation Zone is 1,091 feet. The San Mateo Creek channel is dynamic in this area with substrate of gravel, sand and some cobble being deposited, mobilized and re-deposited in response to storm flows that have occurred over a range of reservoir water surface elevations. The stream channel in the lower Inundation Reach is poorly developed, with limited, short pools and long, runs and riffles. Shading is limited in the lower section where the valley is wide and exposed and where seasonal inundation prevents the growth of perennial species. In this area riparian or bordering vegetation provide only limited shade. Willows exist near the 283-foot elevation presumably because this area is inundated for a shorter time and allows the establishment of perennial vegetation. The upper, narrower section that is upstream of the current fluctuation zone has well established mature vegetation and is well-shaded by the canyon walls and adjacent trees.

Upstream from the Inundation Reach is the Canyon Reach (Figure 2.1). This reach is well-shaded by steep topography and a canopy of coast live oaks (*Quercus agrifolia*), California laurel (*Umbellularia californica*), and big leaf maple (*Acer macrophyllum*). Gradient is steeper in the Canyon Reach compared to the Inundation Reach and gradient increases sharply as the channel nears the road below Mud Dam No. 2. Substrates range from boulders to gravel and sand. Aquatic habitat is well-developed with cascades, riffles, runs and pools. The Canyon Reach extends for 5,806 feet from the upper end of the Inundation Reach to the road crossing downstream of Mud Dam No. 2 and included several steep tributaries that were contributing small volumes of inflow to the creek but were too steep to support fish habitat directly.

The Laguna Creek system has much different geology and topography compared to Upper San Mateo Creek. Instead of being contained within a deep canyon, the Laguna Creek systems occurs within a small, broad, dry valley that is strongly influenced by and parallels the San Andreas Fault. The dominant vegetation in the valley includes oak forests and grasslands, poison oak (*Toxicodendron diversilobum*). and willows (*Salix,* spp). Laguna Creek enters the south end of Upper Crystal Springs Reservoir near the Pulgas Water Temple. The channel in this reach is deeply incised in sands and clays where the channel has cut through a road berm fitted with culverts that was formerly used as a sediment detention area. The corollary Inundation Reach of

Laguna Creek is located in this incised channel section. The tributaries of Spring and Fault creeks join Laguna Creek upstream of the Inundation Zone near between the road to the Filoli property and the washed out road (see Figure 2.2). Spring Creek itself is formed by two tributaries (Spring Creek and North Spring Creek) that join together near the base of the hills to the west of the valley (see Figure 2.2). Upper Laguna Creek includes the west and east tributaries as well as the main Laguna Creek channel. A small tributary that joins Laguna Creek from the east was named East Creek for the purpose of this survey (see Figure 2.2). Laguna and Fault Creeks have markedly straight channels with Laguna Creek paralleling the east side of the valley and the San Andreas Fault while Fault Creek runs in the fault trace along the west side of the valley.

Lower San Mateo Creek is located downstream of LCSD and flows in a northeasterly direction for approximately five miles before discharging into South San Francisco Bay just east of East 3rd Avenue. The habitat survey was conducted for a distance of 3,757 feet from the junction of Crystal Springs and Polhemus roads to the I-280 bridge support (Figure 2.3). The channel upstream of the I-280 bridge support is highly altered with a large 100 foot-long pool (Pool 2) just upstream of the bridge support. This pool was created by episodic discharge from pipes connected to the reservoir. This pool is sustained by a small volume of upstream flow and leakage from the pipes along the north bank of the pool. The upstream end of this pool is about 350 downstream of the dam. The pool has had riprap applied to its south bank for erosion control. Upstream of Pool 2 is a small channel for about 100 feet that is about 4-5 feet wide and a few inches deep with mud substrate supporting cattails and other emergent and riparian vegetation. This channel drains water from the riparian woodland at the base of the dam and the discharge pool closest to the dam (Pool 1). Pool 1 is located about 120 feet downstream of the base of the dam and has also been formed by episodic discharge from the release valve located on the north side of creek. The pool is sustained by groundwater seepage around the dam and leakage from the valve on the discharge pipe. Upstream of Pool 1, there are two indistinct water courses with mud substrate supporting riparian and emergent vegetation that lead from the existing stilling basin.

The surveyed reach of Lower San Mateo Creek is an alluvial channel with well-developed riffles, runs and pools. The creek becomes more of an urbanized stream as it enters Hillsborough about 2 miles east of the dam and in the western edge of the town of San Mateo about 3 miles east of the dam. The urbanized creek sections contain houses bordering both sides of the creek with some sections of channel highly modified. San Mateo Creek is conveyed beneath downtown San Mateo in a covered channel for a distance of about 1,500 feet. The mile of the creek immediately upstream from South San Francisco Bay is tidal and contained within a trapezoidal concrete-lined channel.

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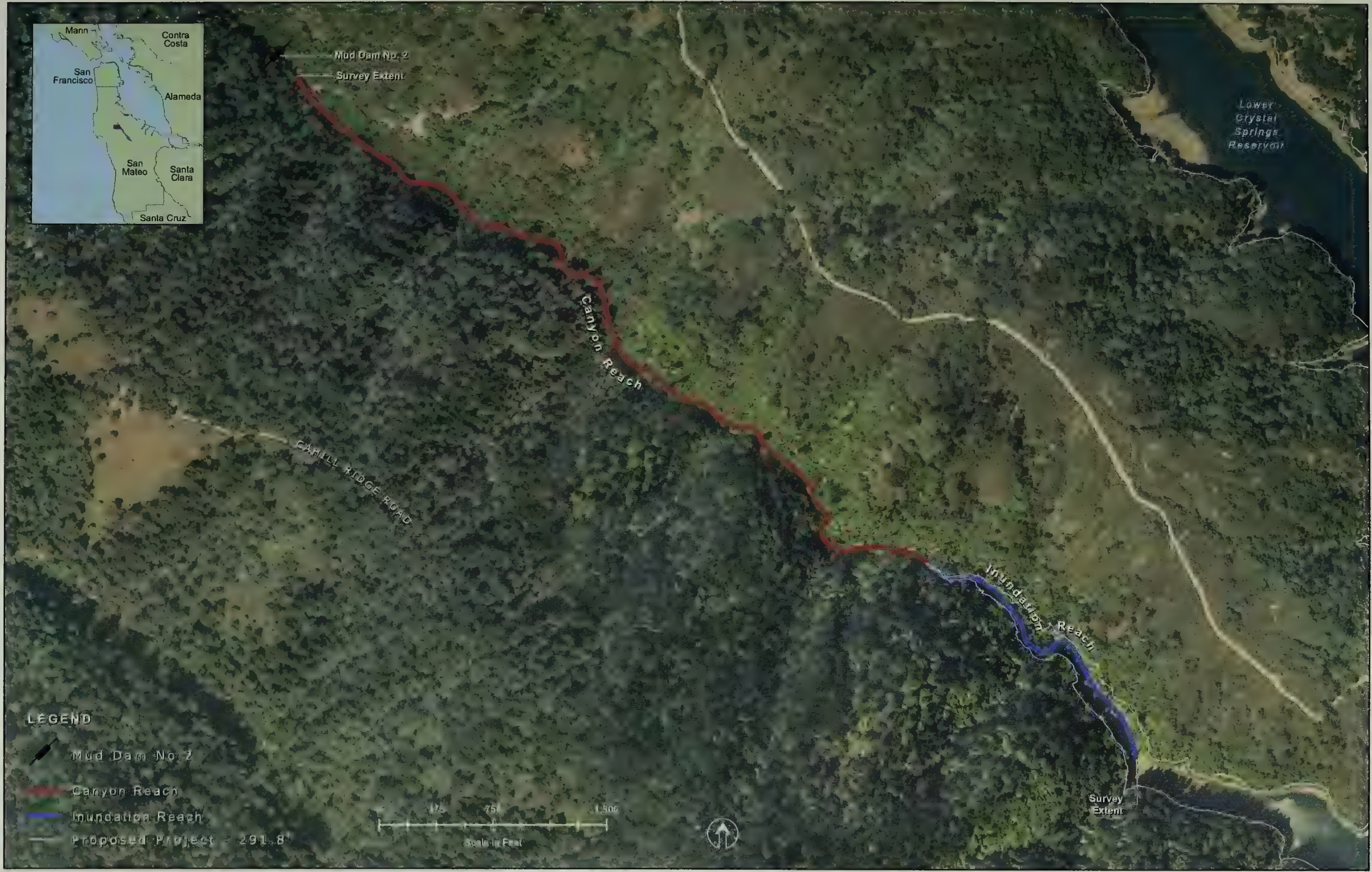

Upper San Mateo Creek Inundation Reach and Canyon Reach

Figure 2.1

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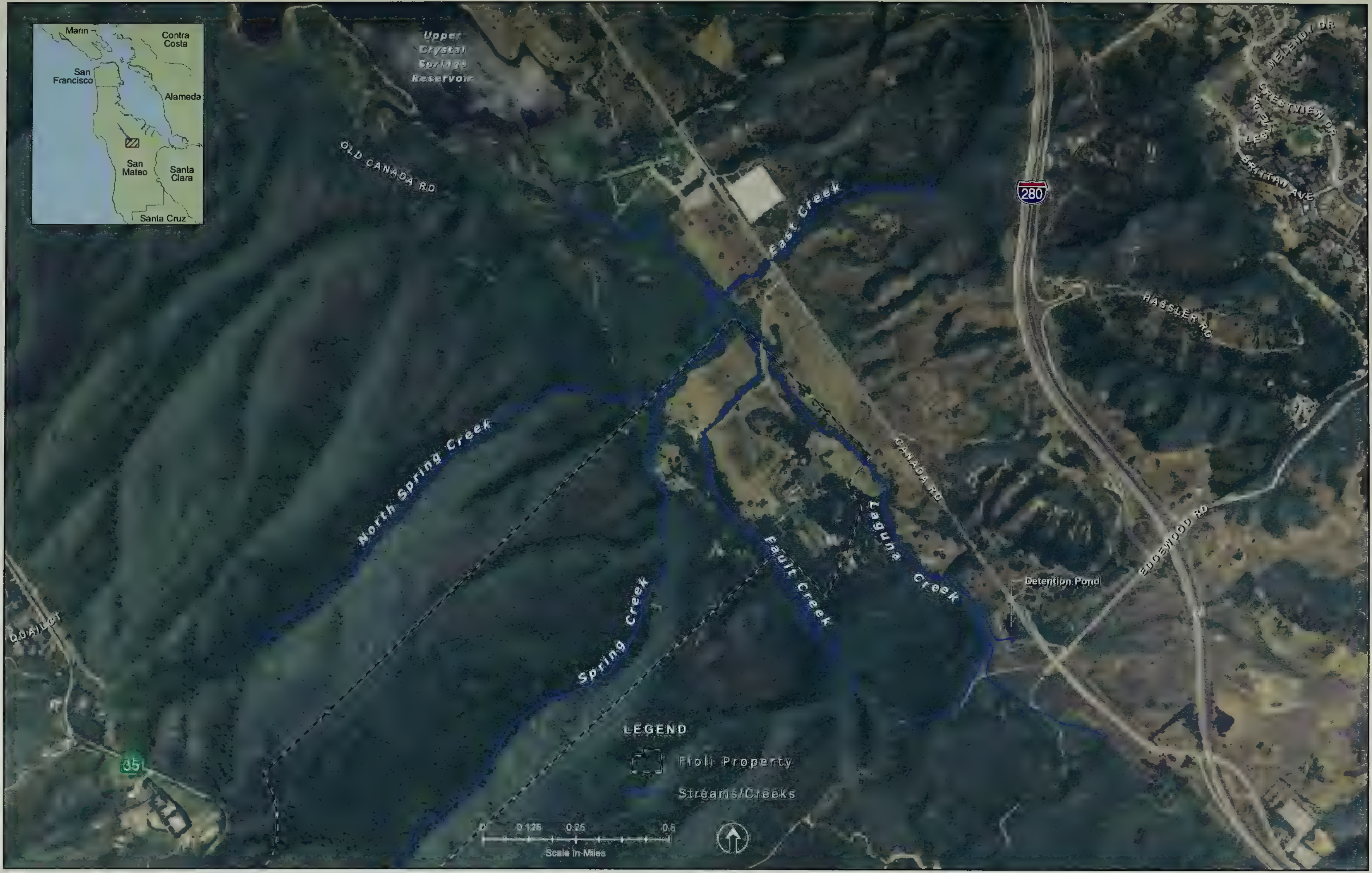

Lower Crystal Springs Dam Improvements Project

Laguna Creek and Tributaries

Figure 2.2

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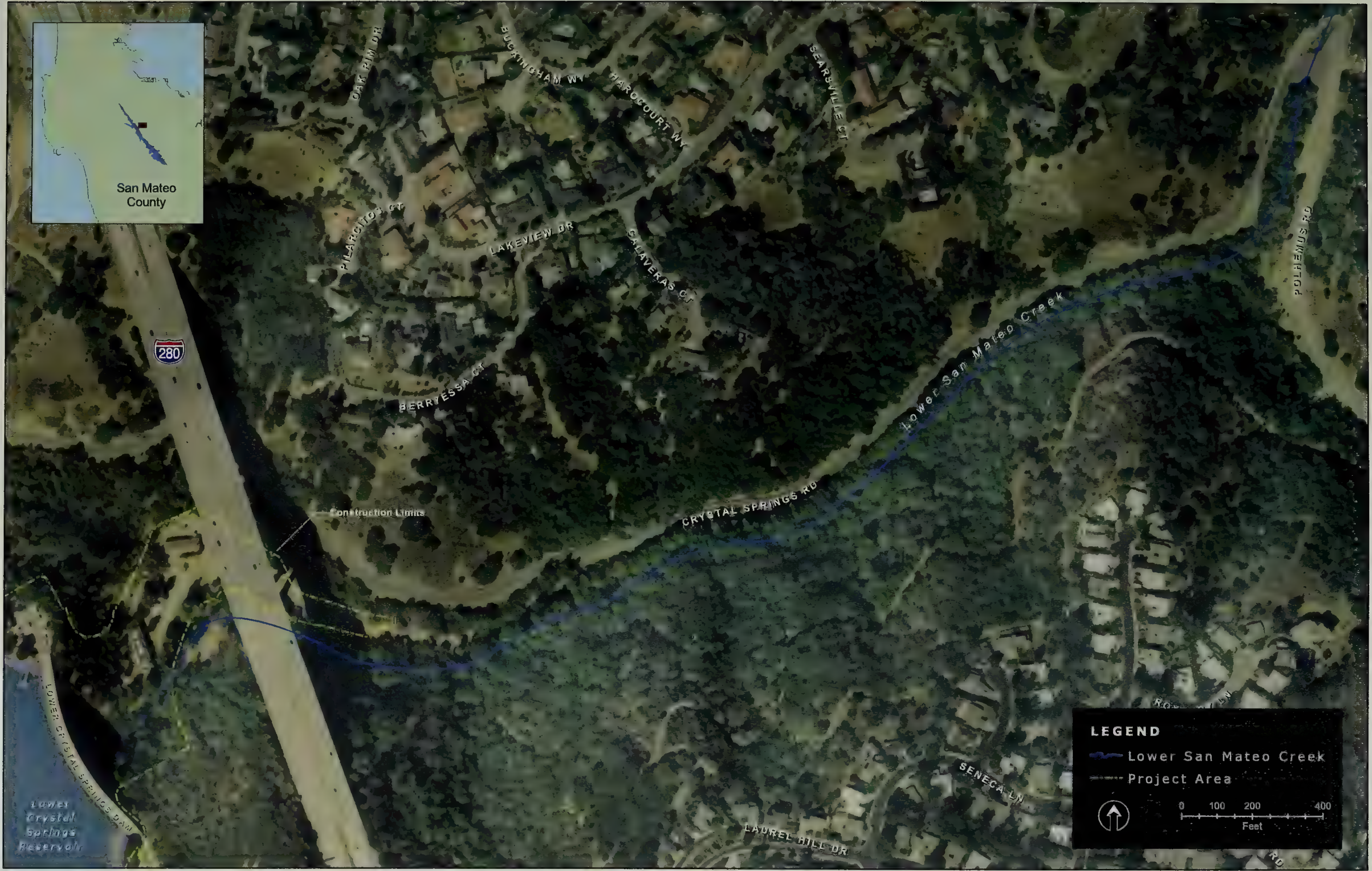

Lower Crystal Springs Dam Improvements Project

Lower San Mateo Creek

Figure 2.3

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3.0 METHODS

The Upper and Lower San Mateo Creek habitat surveys were carried out under a field protocol prepared by ENTRIX/MSE JV and modified to address site specific conditions and the survey purpose. The approach primarily consisted of a habitat typing survey to assess current channel conditions for salmonids and identify the location of potential spawning areas for rainbow trout in Upper San Mateo Creek and steelhead in Lower San Mateo Creek. An initial site survey was conducted on May 10, 2007 to evaluate habitat and stream flow conditions in Upper and Lower San Mateo Creek and in Laguna Creek. The habitat typing survey was conducted on August 28 and 29, 2007 by fisheries biologists from ENTIRX/MSE JV and biologists from the SFPUC. The methods used in this approach are described below. The August 2007 survey occurred during very low flow conditions in Upper San Mateo Creek.

Habitat units were categorized using a modified California Department of Fish and Game Level IV habitat classification system (Flosi et al. 1998). A Level IV habitat survey identifies each habitat unit (pool, riffle run, etc.) and also identifies geomorphic features that form the pool habitats (lateral scour pool, corner pool, plunge pool, mid channel pool, etc.). The habitat classification system was further modified by visually estimating habitat quality (pool cover, amount of shade, and pools with sufficient depth to support older trout, etc). The surveys also estimated the amount of potential spawning areas within the habitat units. Spawning areas contained a mixture of gravel and cobble substrates in locations on the river bed potentially useable by trout for spawning. Areas were located on the map and using GPS, and each site identified was associated with a habitat unit. The area of potential spawning substrate was estimated (in square feet) for each site.

Stream channels in the Laguna Creek system were dry and dominated by sand so it was not useful to apply the same methods to determine habitat value as we employed on Upper and Lower San Mateo creeks. The surveys on Laguna Creek were designed to develop basic information on the creek system such as condition of the channels to potentially support trout spawning and early fry rearing, presence of any surface flows and location of fish passage barriers. The presence of clean gravel and cobbles on the bed was an indication that substrate could support potential spawning habitat. The Laguna Creek system was assessed on November 1, 2007 by a biologist from ENTRIX/MSE JV, and a biologist from the SFPUC.

Key locations in the watersheds and along the streams were mapped using GPS receivers. Channel lengths for habitat units were measured using hip chains and stadia rods and recorded on data sheets. For the San Mateo Creek surveys, the following data were collected for each habitat unit: habitat unit length, average width of the wetted channel, average bankfull width and average valley width. Estimates were made of valley width when dense stands of poison oak or other brush made it impractical to physically measure the valley width. Dominant and subdominant substrates were visually estimated for each habitat unit in the following categories: bedrock, boulder, cobble, gravel, sand, and silt (Wolman 1954). The amount of canopy (percent shade) was visually estimated for each unit. Additional assessments were performed for pool habitats: Maximum residual pool depth (pool depth when flow is zero); pool habitat complexity was given a rating of low, medium, or high then each type of shelter (undercut banks, woody debris, root wad, terrestrial vegetation, aquatic vegetation, boulders/cobble) was evaluated by estimating the amount of cover in a pool by quartiles (1-25, 26-50, 51-75, >75), and habitat present within pools for 4-inch salmonids was rated as "none," "poor," "fair," "good," or "excellent" to evaluate habitat conditions for yearling trout. For each pool, the constraint on habitat quality for salmonids was noted as either flow, depth or cover limited. The presence of potential migration barriers was also noted.

Areas of gravel (with substrate sizes ranging from 0.25 to 2 inches) located within the bank-full channel were assessed as potential spawning habitat during the survey. Potential spawning gravel had to be rounded with low percent fines and located in the tails of pools or the head of riffle or run, or other channel bed locations that would enhance flow through the substrate. The area of each potential spawning site was estimated in square feet with a minimum mapping size of 5 square feet. Potential spawning sites were mapped and attributed to a habitat unit.

In Upper San Mateo Creek, some of the redds[3] constructed during spring 2007 were still evident in the creek channel and were also mapped. Redd features are usually obscured by high flow events that can follow spawning. The 2007 winter was relatively dry with few flow events for fish to use for spawning and even fewer subsequent flows of a magnitude to obliterate the redd features. Redds are a good indicator of where fish spawned in the San Mateo Creek under the flow conditions that occurred during the late winter and spring of 2007. However, it should be noted that redd locations will change each year depending on flow conditions and reservoir levels during the spawning period. Each identified redd was attributed to a habitat unit.

The location and amount of potential spawning habitat which was assessed during the low flow season is not necessarily representative of actual spawning habitat conditions available during the spawning season when flows are higher. Spawning gravel outside of the wetted channel but within the bankfull channel was considered as potential spawning habitat as long as it was located in areas that were low enough that they would have been in the wetted channel during the spawning season.

During the survey, flow conditions in Upper San Mateo Creek were extremely low and some sections of the channel were dry. Habitat typing a dry channel is more difficult and must rely on topography of the channel bed and substrate features to determine habitat. Runs and riffles were determined using a combination of local channel gradient and substrate size or sorting to classify these habitats. Since there was no "wetted channel" in the dry sections of Upper San Mateo Creek, the crew used the whitish deposits that had been left along the edge of the former flowing sections to define the extent of the flowing channel.

The Laguna Creek system was examined using maps and aerial photographs to support the field survey. Location in the watershed was tracked using a Global Positioning Satellite (GPS) receiver and on the ground features were mapped with the GPS unit in the field. Channels were examined from road crossings, by trail or by walking up or down the channel. As many access points as possible were used to assess channel conditions, however because of the amount of channel to investigate and the dense brush along the channels and in the watershed of Laguna,

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[3] A redd is a shallow depression in the substrate, dug by female spawning trout, into which eggs are deposited and then covered.

Fault, and lower Spring creeks this necessitated making assumptions about some channel segments that were not visited or inaccessible. Channels were examined for surface flow and any indicators of surface flow (stands of alders, willows, or other riparian vegetation), the presence of potential spawning substrate and any physical barriers to fish passage. A 2,100 foot length of Laguna Creek channel was walked from the Filoli Road Bridge downstream to a dense patch of overhanging vegetation within the existing inundation zone. The Laguna Creek channel was also walked upstream from the washed out road to near the same dense patch of vegetation.

The Lower San Mateo Creek reconnaissance survey used aerial photographs to support the field work. Location in the watershed was tracked using maps and Global Positioning Satellite (GPS) receiver for on the ground features that were not visible on the maps. Frequent stops were made at road crossings and turn outs and other locations to examine habitat conditions or determine if barriers existed to fish passage.

While a good part of Lower San Mateo Creek channel was examined from road crossings, by trail or by walking up or down the channel, much of the channel exists on private property (primarily within the city limits of Hillsborough and San Mateo) and was not available for inspection. The covered channel beneath downtown San Mateo was also not examined. Channels that were accessible were examined for surface flow, the presence of potential spawning substrate and any physical barriers to fish passage. The survey did not extend beyond Highway 101 because this section is tidal and at the time of the survey was backwatered by a high tide.

After the field surveys were completed, data sheets and field notes were reviewed for missing information. GPS coordinates were transferred and labeled on project maps.

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4.0 RESULTS

At the time of the Upper San Mateo Creek survey on August 28, 2007, the reservoir's water surface elevation was 257.7 feet and much of the Upper San Mateo Creek channel was exposed in the inundation zone well below the current maximum operating elevation of 283.8 feet. Upper San Mateo Creek was dry from about an elevation of about 275 feet near the confluence of the Stone Dam Diversion channel throughout the Inundation Reach up to about the 292 foot elevation resulting in a dry channel distance of about 2,200 feet. The Canyon Reach retained a very low base flow of less than 0.1 cubic feet per second (cfs), except for a few short sections that were dry and for about 1,140 feet of dry channel immediately downstream of the unnamed road crossing below Mud Dam #2.

At the time of the Laguna Creek survey on November 1, 2007 the reservoir water surface elevation was 265.1 feet (Connie Susoeff, Pers. Comm.). The Laguna Creek system was completely dry on this date. There was no flow and no standing water at any location that would have been accessible to trout from the reservoir during the migration period. The only surface flow observed was about 1,000 feet of channel in Spring Creek in the hills to the west of the fault valley on the Filoli property. Flow in this short piece of Spring Creek was much less than 0.1 cfs.

Lower San Mateo Creek was surveyed on August 29, 2007. Stream flow, estimated at about 0.1-0.2 cfs, was being sustained by leakage from LCSD and from discharge from valves located downstream of the LCSD. Additional flows were contributed by Polhemus Creek near the downstream end of the survey. On the August 5, 2008 survey, stream flow near the I-280 Bridge was estimated at about 0.6 cfs. Channel accretion and tributary inflow increased flows to an estimated 2-3 cfs about 3 miles downstream. This flow volume was sustained to the point where the channel entered the underground section. Flow downstream of the underground section was estimated at about 1 cfs and this flow was sustained to tidewater.

4.1 Upper San Mateo Creek

4.1.1 Aquatic Habitat

A total channel length of 6,897 feet was surveyed on the upper San Mateo Creek between the Stone Dam diversion channel and the road downstream of Mud Dam No. 2 (Figure 4.1). We mapped the Inundation Reach and the Canyon Reach. At the time of survey, the channel was dry from the Stone Dam diversion channel upstream for about 2,200 feet. Surface water was present from the very upper end of the Inundation Reach through most of the Canyon Reach, and was dry for the upper 1,140 feet of channel immediately downstream of the road crossing below Mud Dam No. 2. Flow in the portion of the creek that contained surface water was estimated at less than 0.1 cfs. Flow was sustained by accretion, seeps and springs, and tributary inflow along the Canyon Reach.

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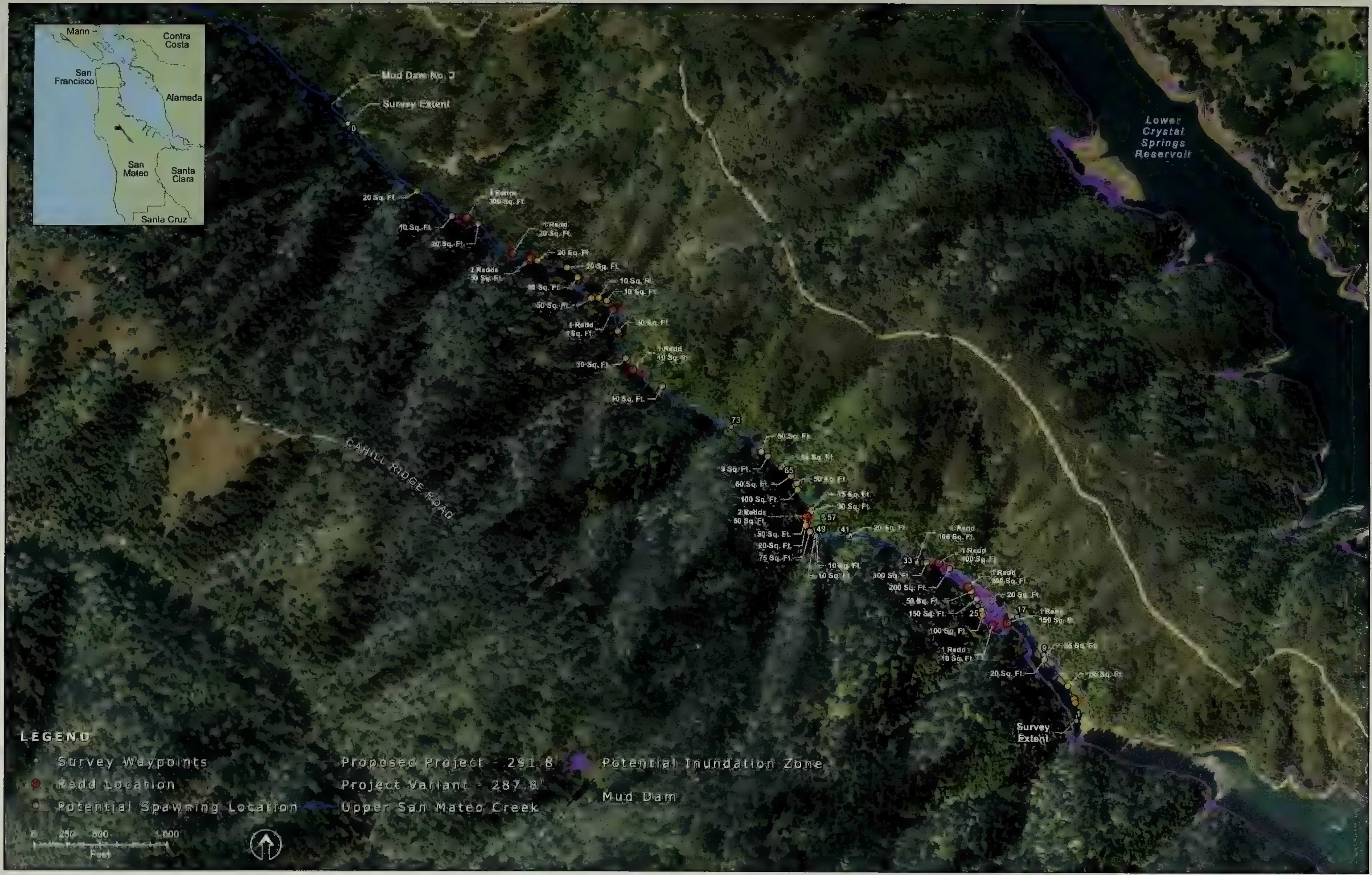

Lower Crystal Springs Dam Improvements Project

Distribution and Amount of Potential Spawning Areas and Observed 2007 Redds within Upper San Mateo Creek

Figure 4.1

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Indications of historic fluctuation levels are present along San Mateo Creek upstream of the reservoir. Backwater effects at varying reservoir elevations along this section of the creek have deposited a wide bed of sediment in the arm of the reservoir. Valley width narrows in an upstream direction. Along the upper section of the historic inundation zone are distinct over-bank deposits that occur at the same elevation along both sides of the present channel bed.

The total length of riffle and pool habitat was about equal within Upper San Mateo Creek accounting for 36.3 percent and 34.9 percent of the total length of the channel surveyed respectively. Run habitat represented slightly less than 30 percent of the aquatic habitat in Upper San Mateo Creek (Figure 4.2 and Table 4.1). Run habitat was more abundant in the lower gradient Inundation Reach while riffle habitat was more abundant in the steeper gradient Canyon Reach.

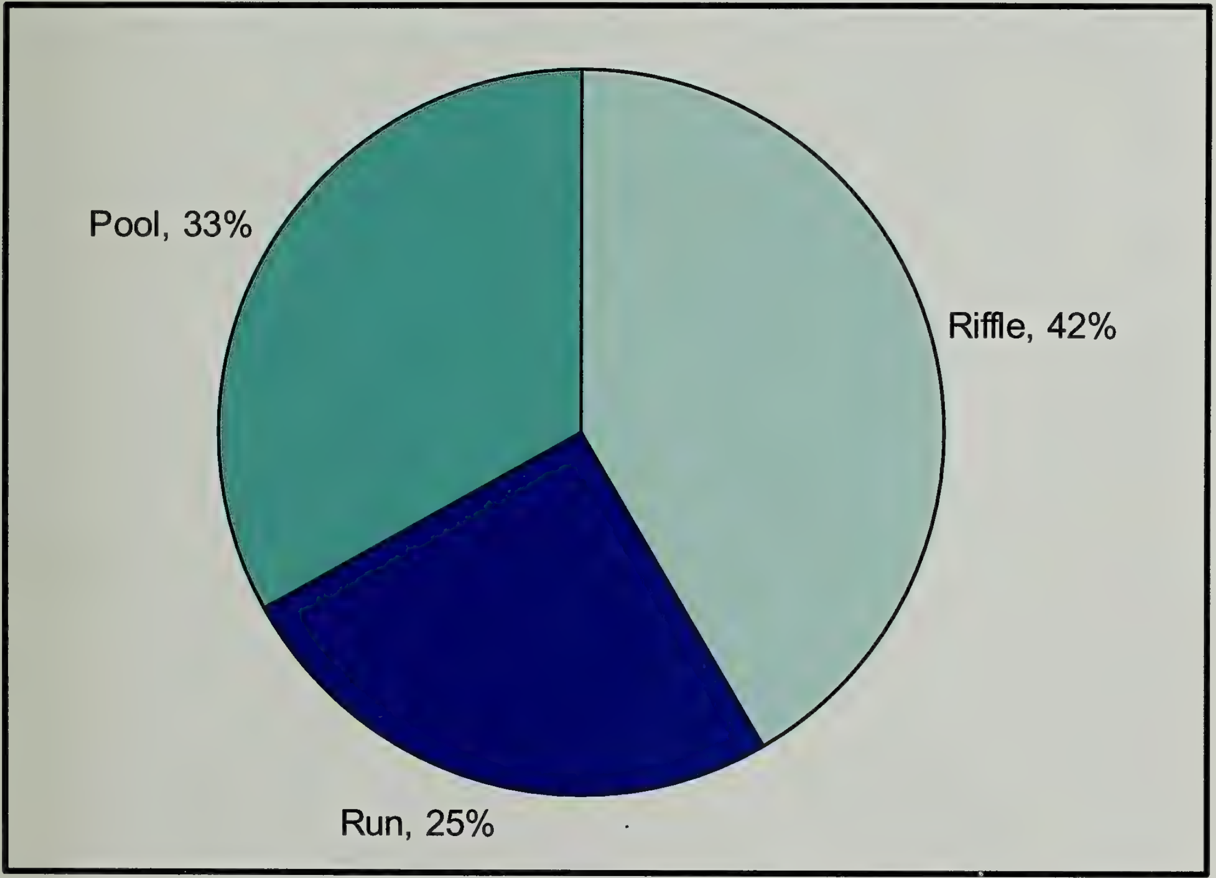


Figure 4.2: **Upper San Mateo Creek Aquatic Habitat Composition by Length**

Table 4.1: Upper San Mateo Creek Aquatic Habitat by Length and Type

	Aquatic Habitat Type		
	Riffle	**Run**	**Pool**
Length (feet)	2,878	1,731	2,288
Percent	41.7	25.1	33.2
Number of Units	54	32	70
Total Length			**6,897**

A total of 70 pool habitats, 32 run habitats and 54 riffle habitats occurred in Upper San Mateo Creek (Table 4.1). Pools were generally mid-channel pools and most pools were shallow and without much cover. Average maximum residual depth for wetted pools was 1.3 feet while the maximum residual depth was 2.5 feet. Riparian shade throughout Upper San Mateo Creek was generally high averaging about 87 percent overall (Table 4.2).

Table 4.2: Upper San Mateo Creek Pool Habitat Characteristics

	Upper San Mateo Creek
Maximum pool depth (feet)	2.5
Average maximum pool depth (feet)	1.3
Average wetted width (feet)	6.1
Percent Pools suitable for 4-inch juvenile trout	17.6
Average Percent Riparian shade for Pool Habitats	86.8

4.1.2 Spawning Habitat

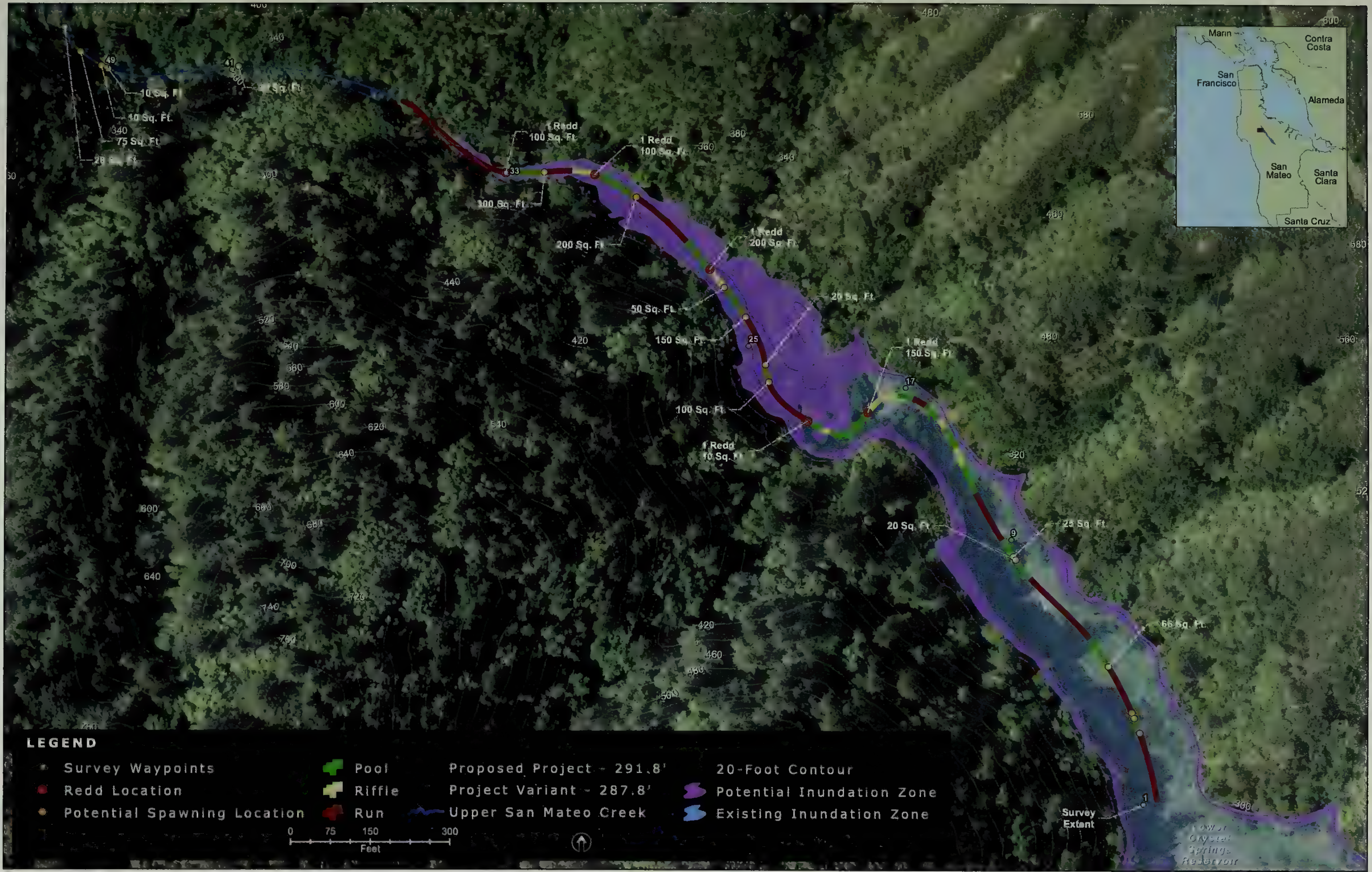
Forty-seven potential spawning areas were identified in Upper San Mateo Creek totaling about 2,710 square feet. Potential spawning areas ranged from 300 square feet to 5 square feet in size. A total of 15 suspected trout redds were counted within the surveyed lengths of Upper San Mateo Creek. The location of redds and potential spawning areas within the upper San Mateo Creek is depicted in Figure 4.1.

4.1.3 Inundation Reach

The Inundation Reach is 1,091 feet long between the 283.8 foot elevation and the downstream end of the Canyon Reach (Figure 4.3). Under the proposed Project, the entire reach would be seasonally inundated. Under the Project Variant, about 60 percent (682 feet) of this reach would be seasonally inundated.

AQUATIC HABITAT

Approximately 57 percent of the length of the Inundation Reach was classified as run habitat. Pool habitat comprised about 34 percent, and riffle habitat was 9 percent by length (Table 4.3). A total of 6 pools, 5 runs and 3 riffles were counted within the Inundation Reach (Table 4.3). Pool habitat had an average residual depth of approximately 1.4 feet and a maximum residual depth of 2.1 feet.



Distribution and Amount of Potential Spawning Areas and Observed 2007 Redds within Upper San Mateo Creek in the Inundation Reach

Figure 4.3

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Table 4.3: Upper San Mateo Creek Inundation Reach Comparison of Aquatic Habitat that Would Be Inundated by the Proposed Project and Project Variant

	Project			Project Variant		
Aquatic Habitat Type	**Pool**	**Riffle**	**Run**	**Pool**	**Riffle**	**Run**
Length (feet)	365	102	624	292	59	331
Percent	33.5	9.3	57.2	42.8	8.7	48.5
Number	6	3	5	5	2	3
Total Length Inundated (feet)	1,091			682		

SPAWNING HABITAT

Ten potential spawning areas totaling 1,230 square feet were identified within the Inundation Reach (Table 4.4) and ranged from 300 square feet to 10 square feet in size. A total of four suspected redds were counted within the Inundation Reach (Figure 4.3 and Table 4.4). Not all potential spawning areas contained redds.

Table 4.4: Redds and Potential Spawning Areas that Would Be Inundated by the Proposed Project and Project Variant

	Propose Project	Project Variant
Number of redds	4	3
Number of potential spawning sites	10	8
Estimated area of potential spawning habitat (square feet) Inundated	1,230	830

4.1.4 Canyon Reach

The Canyon Reach stretches 5,806 feet from the top of the Inundation Reach to the road downstream of Mud Dam No. 2. At the time of the survey, about 4,500 feet of channel had surface flow of less than 0.1 cfs.

AQUATIC HABITAT

Approximately 46 percent of the Canyon Reach was classified as riffle habitat, with 34 percent pools and 20 percent run habitat by length (Table 4.5). There were a total of 54 pools, 46 riffles and 22 runs (Table 4.5). Canyon Reach pool habitat had an average residual depth of approximately 1.2 feet and a maximum residual depth of 2.4 feet.

Table 4.5: Upper San Mateo Creek Canyon Reach Aquatic Habitat by Length and Type

	Canyon Reach		
Habitat Type	**Pool**	**Riffle**	**Run**
Length (feet)	1,923	2,776	1,107
Percent	33.1	47.8	19.1
Number	54	46	22
Total Length (feet)	5,806		

SPAWNING HABITAT

Thirty potential spawning areas were located in the Canyon Reach with a total area of 1,220 square feet ranging in size from 300 to 5 square feet. A total of 10 suspected redds at 6 sites were identified along with 26 other potential spawning sites (Table 4.6). Three sites contained multiple redds, two sites contained two redds each and another site contained 3 redds. Distribution of potential spawning areas and identified redds are shown in Figure 4.1. Identified redds were present at about a quarter of the potential spawning sites identified in the Canyon Reach.

Table 4.6: Redds and Potential Spawning Areas in the Canyon Reach

	Canyon Reach
Number of redds	10
Number of potential spawning sites	26
Estimated area of potential spawning habitat (square feet)	1,220

4.2 Laguna Creek

The survey examined the Laguna Creek channel from the washed out road crossing near the Pulgas Water Temple and at upstream locations in the watershed on the East and West forks and the main channel at road crossings. A 2,100 foot segment of Laguna Creek was walked downstream from the Filoli Road Bridge through a good portion of the Inundation Reach. It was not possible to examine every segment of every creek since most of watershed contains dense stands of poison oak.

Dry channels do not support rearing salmonids so no habitat typing was conducted in the Laguna Creek system. The assessment of the Laguna Creek system focused on identifying locations where potential spawning substrate was present in the watershed and the location of artificial or natural barriers to migration between the reservoir and the spawning habitat. The Laguna Creek system was assessed for early fry rearing habitat that may persist through spring in normal or wetter years.

Laguna Creek contains three headwater channels. One channel enters from the east and one from the west with the main channel joining from the south. The East Fork only provides about 530 feet of channel between the confluence of the main Laguna Creek channel and a concrete channel and valve house (a complete barrier) that drains a detention pond (Figure 4.4). The main channel continues toward the upper end of the watershed crossing under an unnamed dirt access road (Figure 4.4, Site 303) that is a barrier to upstream passage. There is potential spawning substrate in the main channel downstream of the road crossing, as well as upstream; however, it contains a high amount of fine sediment. The West Fork drains a low ridge separating Laguna Creek from Fault Creek, crosses beneath the unnamed access road through a culvert (Figure 4.4, Site 304), runs through a small redwood grove then turns northeast to join Laguna Creek. Potential spawning substrate is present in good quantities in the West Fork downstream of the road crossing. The culvert at the road crossing is a complete barrier to upstream migration but the channel upstream of the road is narrow and steep with a cobble bed and does not provide much in the way of potential spawning habitat.

Near the reservoir and within the inundation zone, Laguna Creek is a sand or clay bed stream and would not support any spawning habitat. A former road crossing near the Pulgas Water Temple once functioned as a sediment basin for many years before being washed out exposing an incised channel of hardpan clay.

Fault Creek was examined from adjacent roads and road crossings. There are no barriers to fish passage on Fault Creek.

The tributary of Spring Creek was surveyed at road crossings and from trails along the creek upstream of the valley floor. The tributary of Spring Creek flows out of the hills from the west and joins with North Spring Creek before joining Laguna Creek about 1,900 feet downstream of the Filoli Road Bridge (Figure 4.4). Barriers to fish passage occur at the road crossing at Spring Creek (Figure 4.4, Site 309) and on North Spring Creek at (Figure 4.4, Site 313). Spring Creek contains potential spawning substrate up and downstream of the road crossing. Spring Creek channel gradient is steep and the substrate is mostly cobble and boulder in the hills to west of the valley. A small water supply dam is located on Spring Creek Dam (Figure 4.4, Site 311). The dam is upstream of a very steep section of Spring Creek that would be a barrier to upstream passage if fish could get past the barrier at Site 309. The only surface water present during the survey was found in the Spring Creek channel in the canyon and only occurred for about 1,000 feet of channel near the bottom of the canyon (Figure 4.4). North Spring Creek contains potential spawning substrate downstream of the road. Survey access to the channel upstream of the road was blocked by dense brush, but based on similar watershed sizes and geology; one would expect conditions similar to Spring Creek.

The channel of Spring Creek on the west side of the fault suggests that it may have once been a tributary to Fault Creek joining Fault Creek where it turns northeast toward Laguna Creek. Movement of the land mass on the west side of the fault to the northwest (relative to the east side of the fault) appears to have shifted the Spring Creek channel northward where it now flows across the valley in its own channel to join Laguna Creek.

East Creek joins Laguna Creek about 1, 200 feet downstream of the Filoli Road Bridge (Figure 4.4). East Creek is a sand bed stream and provides no potential spawning habitat or permanent surface flows.

4.2.1 Spawning Habitat

The Laguna Creek system was assessed for spawning habitat by visually examining the channel segments for the presence of gravel and cobble in sufficient quantities and in a bed configuration that would provide potential spawning substrate. Channel segments that contained such substrate were identified in the field and the upstream and downstream extent of potential spawning substrate was mapped.

Laguna Creek provides no spawning habitat downstream of the Filoli Road Bridge and this includes all channel segments that would be inundated up to and well upstream of the proposed Project level of 291.8 feet. The channel throughout this reach was completely dry on November 1, 2007. The bed is composed of sand with some areas of hardpan clay.

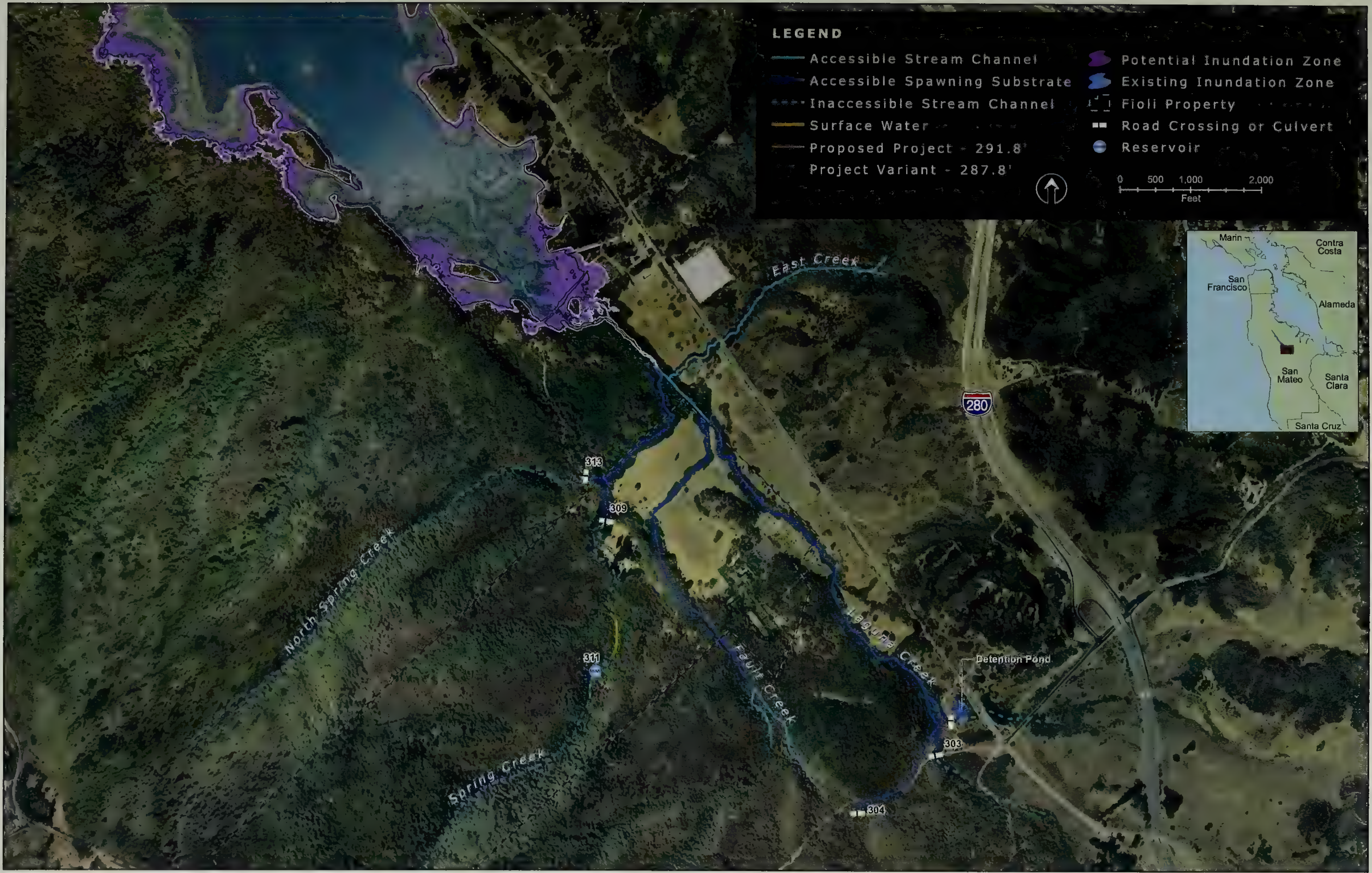
The Laguna Creek channel was walked from the Filoli Road Bridge downstream into the existing inundation zone specifically to examine beds of potential spawning gravel that had been reported to occur within the inundation zone or in close proximity to the reservoir. Several beds of gravel were located in this reach, most associated with tributary confluences. Examination of the gravel beds revealed a thin layer of gravel over sand and was evaluated to be unlikely to support successful spawning.

The Laguna Creek system is accessible to fish from UCSR up to the fish barriers (Figure 4.4). The main channel of Laguna Creek up to the Filoli Road Bridge has the least suitable substrate because of a greater proportion of fines in the channel bed. Fish access to East Laguna Creek ends at a turnout and valve house from a detention pond installed on the tributary. Substrate in the East tributary is of fair quality for spawning. The best spawning substrate is located on West Laguna Creek up to an impassible barrier at Site 304. There is good quality spawning substrate downstream of the road; however, upstream of the culvert the channel is narrow and steep and contains cobble and boulder substrate.

Spawning gravels were noted in Fault Creek from near the road crossing between the agriculture fields where the creek turns to parallel the fault trace to the upstream tributaries. The Fault Creek channel bed was composed of sand at the confluence with Laguna Creek.

Spring Creek and North Spring Creek contained potential spawning gravels up to the unnamed road that crosses each tributary and form barriers to upstream migration (Figure 4.4 Sites 309 and 313). The Spring Creek channel bed was composed of sand at the confluence with Laguna Creek.

There were about 8,300 feet of channel in Laguna Creek, 4,200 feet of channel in Fault Creek, about 1,800 feet of channel in Spring Creek and 300 feet of channel in North Spring Creek that would support spawning and would be accessible to fish from Upper Crystal Springs Reservoir (Table 4-7). Migration barriers occur in all streams except Fault Creek. Additional spawning habitat is available in Spring and North Spring Creek upstream of the barriers. A small amount of year round rearing habitat is available in Spring Creek upstream of the barrier.



Laguna Creek

Figure 4.4

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Table 4-7: Laguna Creek System Channels Supporting Potential Spawning Habitat

	Channel with Spawning Substrate[1] (linear ft)		Channel to support Early Fry Rearing[2] (linear ft)		Channel to support Year-Round Rearing[3] (linear ft)	
	Accessible	**Inaccessible**	**Accessible**	**Inaccessible**	**Accessible**	**Inaccessible**
Laguna Creek	8,300	800	9,600	500	0	0
East Creek	0	0	0	0	0	0
Fault Creek	4,200	0	4,500	0	0	0
Spring Creek	1,800	2,100	1,800	2,100	0	2,100
N. Spring Creek	300	?	300	?	0	?
Total	**14,600**	**2,900**	**16,200**	**2,600**	**0**	**2,100**

[1] Channels supporting gravel and cobble substrates in sufficient quantities to support redd construction

[2] Channels that would carry flow in the spring/early summer and provide habitat for trout less than 2.5 inches in size

[3] Channels that sustain year-round flows and temperatures to support trout

? Channel was inaccessible to survey crew.

Note: No estimates are available for the inaccessible portion of North Spring Creek.

4.2.2 Rearing Habitat

Rearing habitat requires year-round stream flows and the only location that had surface water in November of 2007 was a 1,000 foot section of Spring Creek well upstream of the passage barrier. Surface flow is present in the channel to and downstream of the barrier in most years on Spring Creek and young trout have been collected downstream of the bridge (but not upstream) during summer (M. Shoenfisch, pers com 2007). Assuming that surface flow would be present in Spring Creek about to the confluence of North Spring Creek, there would be about 600 feet of year-round rearing habitat in normal and wetter years. There would be about additional 2,100 feet of year-round surface flow upstream of the fish passage barrier on Spring Creek up to the steep, impassible reach within Spring Creek Canyon.

Early fry rearing could occur within all the channel segments between the passage barriers and the reservoir in years with sufficient late spring or early summer flows (see Table 4-7). This includes about 9,600 feet of Laguna Creek (upstream of the Project Inundation Zone), 4,500 feet of Fault Creek, and 1,800 feet of Spring Creek and 300 feet of North Spring Creek. Fry that rear in these reaches would have to migrate to the reservoir prior to surface flows disconnecting from the reservoir.

4.3 Lower San Mateo Creek between LCD and Polhemus Creek Confluence

4.3.1 Aquatic Habitat

The habitat survey covered a length of 3,757 feet on Lower San Mateo Creek from the intersection of Crystal Springs and Polhemus roads to the I-280 bridge abutment (Figure 4.5). The survey did not extend upstream of this location because the channel is highly modified at the lower discharge pool (Pool 2) and is substantially different from here to the dam compared to habitat found downstream.

In the surveyed section of Lower San Mateo Creek, pool habitat comprised about 53 percent of the total length of the channel with runs and riffles accounting for 36 percent and 11 percent respectively (Table 4.8). A total of 35 pools, 20 runs and 15 riffles were documented within the surveyed section of lower San Mateo Creek.

4.3.2 Spawning Habitat

Seven potential spawning areas were located in the Lower Reach with a total area of 951 square feet (Table 4.9) ranging in size from 16 to 500 square feet. Most of the potential spawning areas were located in the middle of the surveyed reach between 1,349 and 2,099 feet upstream of the start of the survey. The field crews did not observe any potential redds constructed during the 2007 spawning season. The location of potential spawning areas within Lower San Mateo Creek is shown in Figure 4.5.

Table 4.8: Lower San Mateo Creek Aquatic Habitat by Length and Type

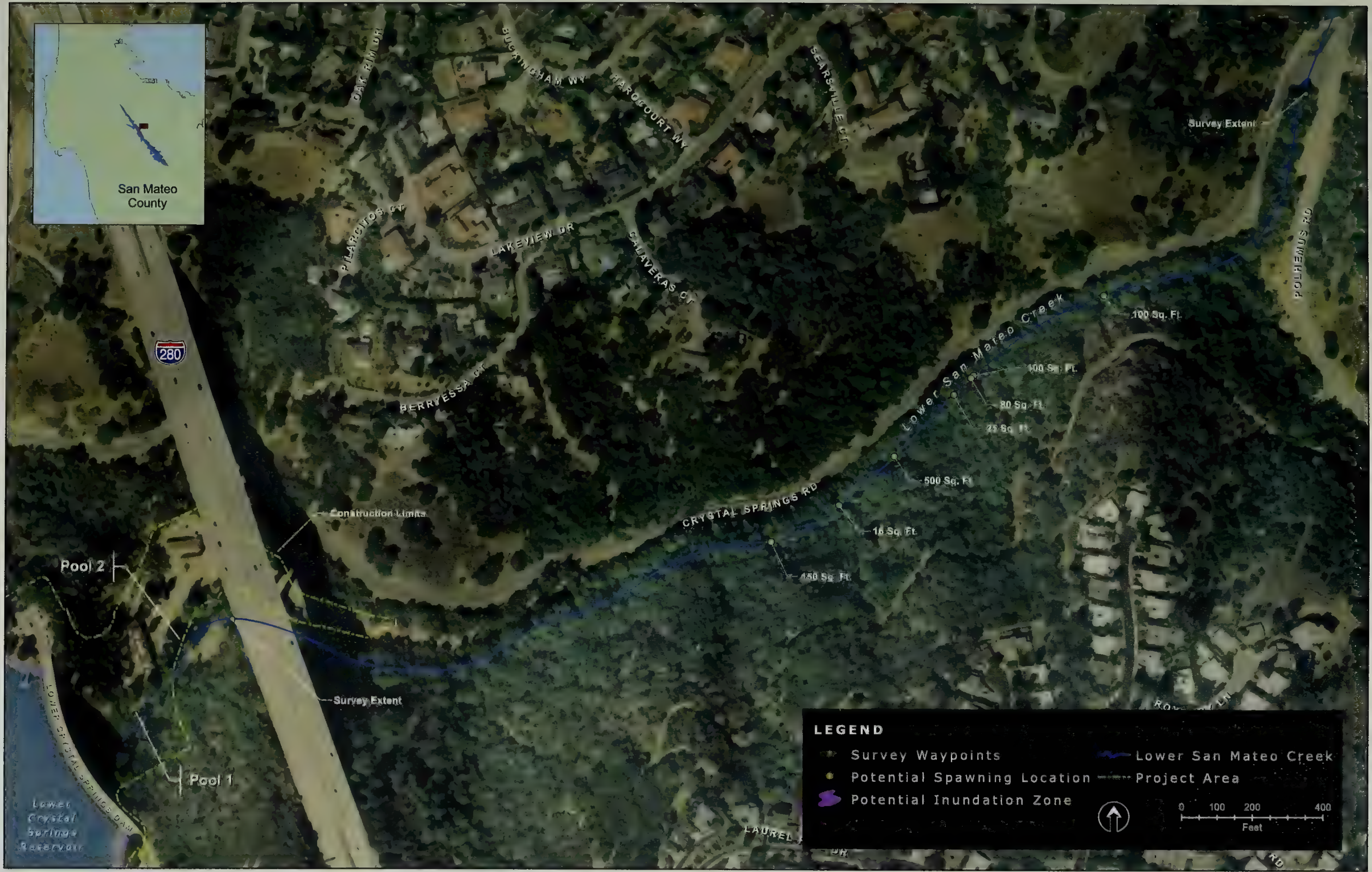
	Aquatic Habitat Type		
	Riffle	**Run**	**Pool**
Length (feet)	414	1,347	1,996
Percent	11.0	35.9	53.1
Number	15	20	35
Total Length (feet)		3,757	

Table 4.9: Potential Steelhead Spawning Habitat Observed within Lower San Mateo Creek

	Lower San Mateo Creek
Number of redds observed	0
Number of potential spawning areas (poor suitability)	7
Estimated area of potential spawning habitat (square feet)	951

4.4 Assessment of Lower San Mateo Creek

A reconnaissance level survey was conducted on Lower San Mateo Creek between LCSD and Highway 101 on 5 August 2008 by fishery biologists from ENTRIX and the SFPUC, a hydrologist from ENTRIX, an engineer from BEM and two regulatory specialists, one each from BEM and MEA. The purpose of the survey was to assess the overall habitat condition in Lower San Mateo Creek from the dam to near the Bay and determine if there are obvious fish passage constraints or rearing habitat or spawning habitat issues and that would limit the value of this creek to support rainbow trout/steelhead. The survey began at the base of CSD and ended at the intersection of East Third Avenue and South Humboldt Street in the City of San Mateo, immediately east of Highway 101 (Figure 4.6).



Distribution and Amount of Potential Spawning Areas within Lower San Mateo Creek

Figure 4.5

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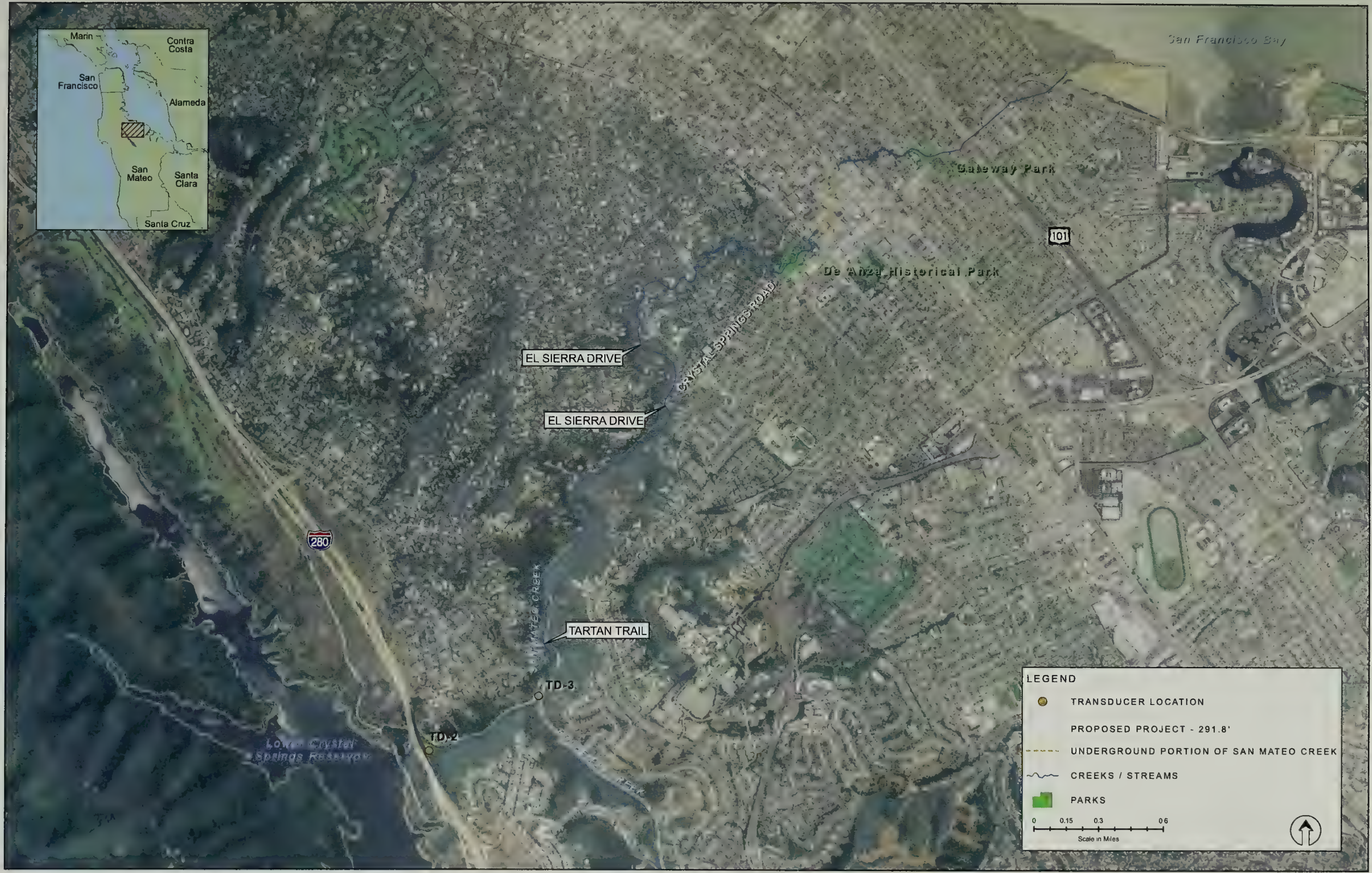

Figure 4.6
Lower San Mateo Creek

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Included in the survey was the lower 300-400 feet of Polhemus Creek, the only tributary we encountered on the survey. Lower San Mateo Creek was spot surveyed along Crystal Springs Road by car in a downstream direction stopping at each bridge crossing or convenient turnout to check fish passage conditions at road crossings or to examine general habitat conditions. We made observations of channel flow, noted locations of inflow, fish species observed and general habitat conditions. In the more urbanized reach of the creek (Hillsborough and San Mateo) access to the creek was mostly restricted by private ownership and the creek was examined at road crossings or where public roads paralleled or crossed the creek. The creek was surveyed in this manner all the way to tidewater, except for the 1,500 feet of channel that is beneath buildings in the town of San Mateo between South El Camino Real and the railroad tracks.

Lower San Mateo Creek can be classified into three general reaches: 1) the Foothill Reach extending 0.8 miles from the I-280 bridge to the base of the hills at the Crystal Springs Road bridge near the intersection of El Cerrito and Crystal Springs roads in the City of Hillsborough; 2) a Valley Floor Reach, extending 3.6 miles from the bridge through the remainder of Hillsborough to the underground reach; 3) the Urbanized Reach, the 1.6 miles of channel that includes the underground section to the Bay including the tidewater reach between Gateway Park and the Bay.

The Foothill Reach has a relatively confined valley width, additionally constrained by the construction of Crystal Springs Road, an SFPUC water pipeline and a sewer line along the creek. Habitat within this reach appears to be in relatively good shape with riffles, pools and runs in a well-shaded canyon bottom. Pools are deep and provide good cover elements. In this reach flows ranged from close to 1 cfs below the confluence with Polhemus Creek to about 3 cfs near the lower end of the reach. We noted at least two former tributary channels in this reach had been filled and paved over with streets. Sacramento suckers and rainbow trout were observed in pools and runs within this reach.

The Valley Floor Reach is much more of an urban channel as the creek borders roads, schools, and front and back yards. Some sections of the creek have been channelized but most of the channel has at least one bank that is somewhat natural, however the channel is dominated by urban influences. Pools are present, but are not as large and deep or with as much cover as observed in the Foothill Reach. Gravel resources are good and riffles are common. Young of the year rainbow trout were abundant and several larger juveniles were noted. The other fish species frequently observed was threespine stickleback.

The Urbanized Reach of San Mateo Creek includes a 1,500 foot long section that passes beneath the City of San Mateo between South El Camino Real near West 3rd Avenue to the railroad tracks just north of the San Mateo Caltrain Station. The creek is then very confined between floodwalls to Gateway Park where it becomes tidally influenced just upstream of the flood control channel connecting the creek with South San Francisco Bay. From where the creek exited from beneath downtown to Gateway Park the creek habitat is only rated fair and the only fish species observed was three-spine stickleback. The channel is mostly run and pool habitat with limited riffles. There did not appear to be any passage problems in the channel sections examined. We did not examine the section beneath the City of San Mateo.

Habitat conditions were verified at the base of the dam. The channel conditions between the existing stilling basin and Pool #1 are unsuitable for salmonids. Two poorly defined channels that are 1-2 feet wide and up to 4 inches maximum depth exist between the stilling basin and Pool #1. Channel beds are composed of mud and both channels are vegetated with emergent and riparian vegetation. The channel between Pool # 1 and Pool #2 is slightly better defined, somewhat wider and is mostly composed of mud and contains a dense growth of emergent vegetation. At the flows observed, neither channel has habitat that would be considered suitable to support juvenile rainbow trout. Species observed in the pools during the survey were mosquito fish and several large carp in Pool #1.

Lower San Mateo Creek is perennial from Pool #2 all the way to the Bay. Flow in the upper part of the creek was estimated at about 0.6 to 1 cfs and increased in a downstream direction up to about 2-3 cfs at where the channel entered the underground section. Surface flows were estimated at about 1 cfs from the bottom of the underground section to Gateway Park.

A small inflow occurred from Polhemus Creek and some seepage was noted from a culvert on the north side of the box culvert beneath the Crystal Springs Road Bridge at Polhemus Road. Tartan Trail and Crystal Springs Terrace roads appear to have been constructed in what used to be former tributary canyons to San Mateo Creek. Culverts discharging from beneath each road were providing additional flows to San Mateo Creek.

Most of the bridge crossing of San Mateo Creek are clear arch concrete bridges that appeared to have been constructed at around the late 1920s to 1930s and allow the natural streambed to convey the creek beneath the bridges. A modern concrete box culvert design bridge is located at Crystal Springs Road at Polhemus Road and represented the only potential fish barrier we observed during the survey. The north barrel is full of sediment and flow was only present in the south barrel. The barrel is about 60 feet long and 8 feet wide with a depth of flow of 1-2 inches observed along the south side of the south barrel. Immediately downstream of the box culvert is a 1921-era bridge that is no longer used. There is no problem from a fish passage standpoint with the old bridge. However there is limited clearance between the streambed and the bridge deck and it may create problems during high flows.

About a half mile downstream is a twin barrel corrugated arch culvert where the Tartan Trail crosses Lower San Mateo Creek. All baseflow was passing through the north barrel, where a tributary entered Lower San Mateo Creek from a hung culvert along the north bank beneath Tartan Trail. The Tartan Trail culvert does not present an impediment to upstream passage within San Mateo Creek.

The only unknown part of the creek for fish passage is the section of creek that runs beneath the City of San Mateo. An earlier survey noted there appeared to be no passage impediments in this section of the creek as the channel bed was composed of natural streambed materials with buildings supported by concrete pilings (Kline 2000). The downstream end of the channel is consistent with this observation, however, during the August 5, 2008 survey, the upper end of the channel is a double barrel box culvert. Since the findings of this survey regarding the underground section are not consistent with earlier findings, the assumption that fish passage is not a problem through the section of creek beneath downtown San Mateo remains in question.

Aquatic habitat conditions were generally good throughout the length of the foothill and valley channel segments with well-shaded run, riffle and pool habitats common in both reaches. Pool depths of 4 to 5 feet occur in the foothill reach and areas of rounded gravel are found in pool tails and riffles. The channel is naturally confined by topography but this confinement has been exacerbated by the placement of Crystal Springs Road on one side and a sewer and water line on the other side. At numerous locations along the creek vertical retaining walls or rip rap has been used to protect the county road, the sewer line or the water pipeline. The pipeline crosses the creek at several locations.

Downstream of the foothill reach, the channel gradient is less; channel confinement is less but does occur from roads and or private property that have encroached on the floodplain. Pool quality in this reach is not as good compared to the foothill reach the pools are not as deep and the channel is less confined within canyon walls. Riffles are present and spawning habitat is present all the way to at least De Anza Park (just West of South El Camino Real), and substrates tend to be composed of more gravel and sand and less cobble-sized material than in the foothill reach.

Juvenile rainbow trout were observed in San Mateo Creek from the upper sections of the foothill reach beneath the second crossing of San Mateo Creek by Crystal Springs Road all the way to De Anza Park. Sacramento suckers also were observed in the foothill reach. Three spine stickleback were observed in the channel on the valley floor reach and were observed along the channel all the way to tidewater.

The Polhemus Creek channel at the confluence of Polhemus and San Mateo Creek was primarily composed of fist-sized angular cobbles that had washed down from an upstream restoration project. About 300 feet upstream from the confluence on Polhemus Creek is a short, steep boulder falls rising about 15 feet in series of three steps. While there is a small jump pool at the base of the falls, there is no such pool between the second and third steps. The upstream step of the falls is off set about 20 to 25 feet from the base of the falls. The off set of the upper fall step and the lack of an intermediate step jump pool indicates the falls would be a substantial impediment to any upstream migrating fish.

Potential spawning substrate in San Mateo Creek upstream of Polhemus Creek was very poor relative to substrate conditions in the remainder of the Foothill Reach or in the Valley Reach. Substrate was angular and would not easily support successful spawning. Angular substrate tends to lock in place and it takes substantially more effort for a fish to construct a redd in this material as compared to rounded river rock. The angular rock will cause much more fin abrasion during redd construction, causing physical damage to spawning fish. The lack of rounded river rock is likely due to the 100+ year presence Crystal Springs Dam that has completely eliminated sediment transport past the dam.

4.4.1 Fisheries Survey, October 2008

Biologists from the San Francisco Public Utilities Commission sampled four sites on Lower San Mateo Creek between the I-280 bridge and the crossing of the Crystal Springs No. 2 pipeline on October 27 and 28 in 2008 (SFPUC unpublished data) (Figure 4.6). The following is a brief summary of the findings, which at this time should be considered preliminary.

A total of four sites were sampled using depletion electrofishing. Sites ranged in length from 103 to 186 feet long. Four species of fish were captured including rainbow trout/steelhead, prickly sculpin, threespine stickleback and Sacramento sucker. Rainbow trout and prickly sculpin were captured at all four sites, threespine stickleback were captured at three of the four sites and Sacramento suckers were captured at one site.

Captured rainbow trout were measured and weighed. Length frequency distribution indicates at least three distinct size groups are present likely representing at least 3 age groups: 0+ (young of the year), 1+ (yearlings) and 2+ (two-year old fish) (Figure 4.7). The mean condition factor by site for rainbow trout ranged from 1.071 to 1.202, indicating the fish have sufficient weight for their length (poor condition fish have factors of less than 1.00). The density of rainbow trout within each sampled site expressed as fish/mile of channel range from a high of 2,125 fish per mile to a low of 1,278 fish per mile.

The fish population found within Lower San Mateo Creek along with flow and habitat conditions indicate that reproduction is occurring within the creek, multiple age classes of trout are present and fish have good body weight for their length. Additionally, the creek supports a completely native fish community.

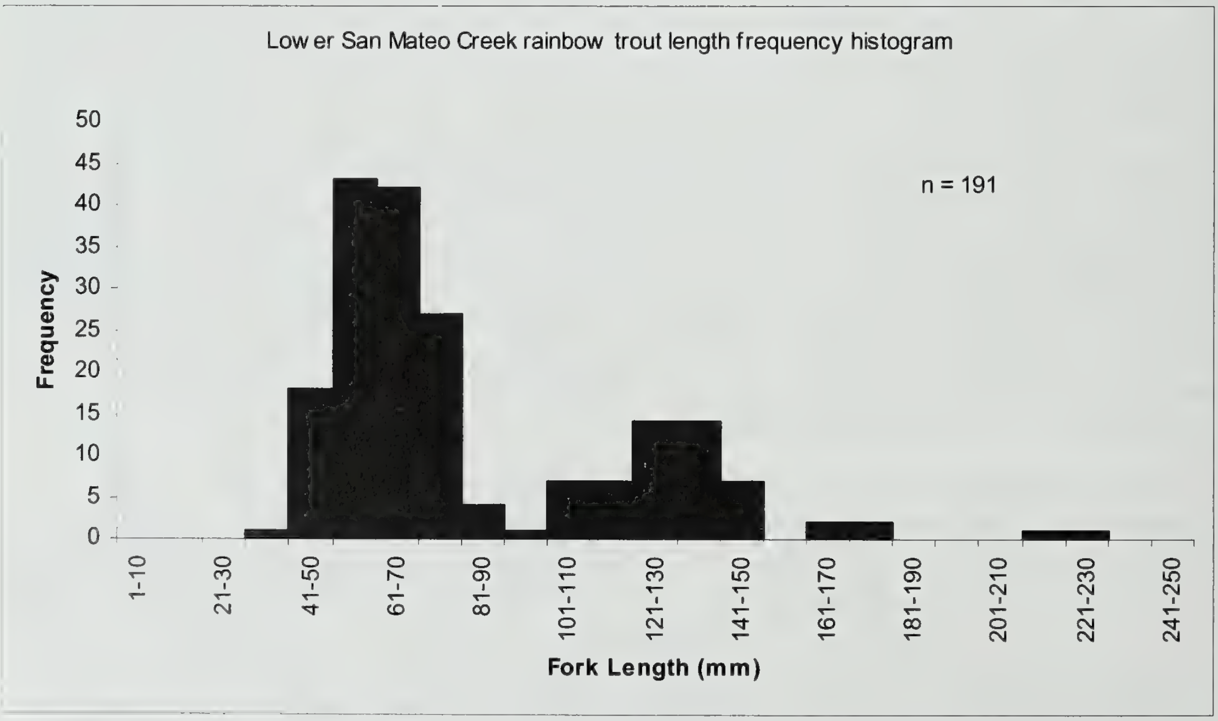


Figure 4.7: **Length Frequency Histogram of Rainbow Trout from Four Sites in Lower San Mateo Creek Showing Three Age Groups: 0+ (30-99mm), 1+ (110-179mm) and 2+ (>179mm). (Preliminary data from SFPUC)**

5.0 DISCUSSION

5.1 Upper San Mateo Creek

Habitat found within Upper San Mateo Creek supports seasonal migration, spawning, incubation and rearing of rainbow trout from LCSR. Under existing operating conditions when the reservoir is full at 283.8 feet elevation, about 1,091 feet of San Mateo Creek channel is available in the Inundation Reach. Habitat in this reach includes six pools, three riffles and five runs supporting about 1,230 square feet of potential spawning habitat and four of the redds identified in 2007 (Table 5.1). Under the proposed Project with the reservoir full at an elevation of 291.8 feet elevation all this habitat would be converted to reservoir habitat (Table 5.1). Under the Project Variant with the reservoir full at 287.8 feet elevation, about 409 feet of San Mateo Creek channel would be available in the Inundation Reach. Habitat in this reach would include one pool, one riffle and two runs supporting about 400 square feet of potential spawning habitat and one of the redds identified in 2007 (Table 5.1). No part of the Canyon Reach would be affected by the proposed Project or Project Variant and all habitat in that part of the creek would remain available.

The 2007 habitat survey that was conducted began at about elevation 275 and included some channel length below the 283.8 foot maximum reservoir operating elevation. Habitat downstream of this level is already seasonally exposed to fluctuations under existing conditions. Some of the stranding issues occur in this section of the creek.

Table 5.1: Comparison of Existing Conditions to the Project and Project Variant Conditions for the Inundation Reach and Habitat Available in the Canyon Reach of Upper San Mateo Creek

Inundation Reach	Channel Length (ft)	Pools	Riffles	Runs	Redds	Spawning Area (sq ft)
Existing Conditions	1,091	6	3	5	4	1,230
Proposed Project	0	0	0	0	0	0
Project Variant	409	1	1	2	1	400
Canyon Reach	5,806	54	46	22	10	1,220
Total (Inundation and Canyon Reaches)	**6,897**	**60**	**49**	**27**	**14**	**2,450**

An increase in the reservoir's maximum operating surface water level from 283.8 feet to 291.8 feet would seasonally reduce the amount of San Mateo Creek channel by 1,091 lineal feet, or equate to a reduction of about 16.3 percent of the channel length available to trout from LCSR under existing conditions. These impacts are illustrated in the stream profile in Figure 5.1. This increase in water surface elevation would seasonally inundate six pools, five runs, three riffles, 1,230 ft^2 of potential spawning area and four of the redd sites observed during the August 2007 survey (the other redd site would have been inundated under existing conditions). Upper San Mateo Creek has sufficient habitat to sustain migration, spawning, incubation and rearing habitat in the 5,806 feet upstream from the proposed maximum operating water level. The survey documented at least 26 potential spawning sites totaling over 1,220 ft^2. Ten redds were found at six locations in the Canyon Reach indicating that about 20 more sites were potentially available for spawning. Spawning habitat is not a limiting factor in Upper San Mateo Creek. The impact to spawning habitat for rainbow trout from LCSR by the proposed Project or Project Variant would not be significant.

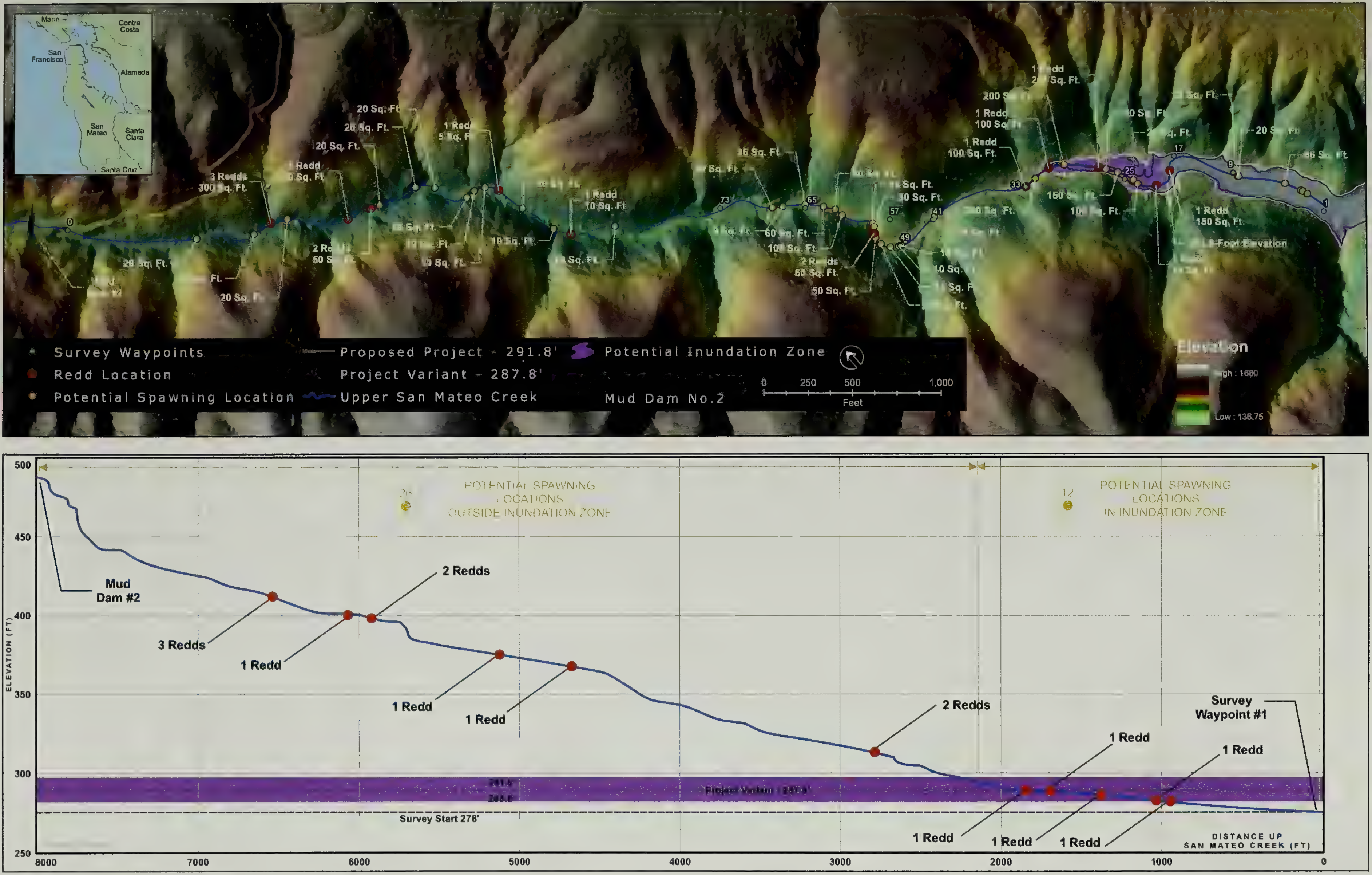
Flooding of some or all of the Inundation Reach does not necessarily mean that redds would be drowned in the Inundation Reach under future operational scenarios. Rainbow trout will use habitat that is available for spawning during the spawning season. Gravel bars or spawning sites that are beneath the reservoir at the time of spawning would not be used. Redds would be drowned if trout spawned within the fluctuation zone and then reservoir operations increased the water surface elevation over the redd. This can happen even under exiting conditions.

Rearing habitat quality in the 1,091 feet of the Inundation Reach is limited. Pools are generally shallow and exposed and most of the habitat is run habitat. Early fry rearing occurs in the Inundation Reach, but because flow in the Inundation Reach is seasonal, it provides no rearing habitat during the summer and fall. The impact to rearing habitat for rainbow trout from LCSR by the proposed Project or Project Variant would be less than significant.

Trout fry and juveniles will disburse into new habitats driven by overcrowding as young fish hatch out of the redds and enter the stream. In Upper San Mateo Creek during May of 2007 thousands of fry were in the Inundation Reach, presumably on their way to the reservoir. At the time of the site visit about 300 to 400 feet of channel was dry in the vicinity of the most downstream redd at a location where the channel passes through a large deposit of gravel and cobble (Figure 5.1). The creek had recently lost surface flow throughout much of this reach and only a few isolated pools held water. Fry and juvenile trout were trapped in the pools and were dead or dying in the riffles and runs. Operating the reservoir to the historic maximum operating level of 291.8 feet by February of each year and maintaining that level until early July would eliminate stranding of fry that occurred in May 2007 because the bar would be covered with about 5 feet of water. Operating the reservoir to the Project Variant level of 287.8 feet by February of each year and maintaining that level until early July would also eliminate stranding of fry that occurred in May 2007 because the bar would be covered with about one foot of water and maintain the connection between Upper San Mateo Creek and LCSR. Either of these operations would likely be a benefit of the project by improving outmigration conditions from Upper San Mateo Creek to LCSR.

5.2 Laguna Creek

The Laguna Creek system contains no spawning habitat within the existing fluctuation zone or within the Inundation Reach or that would be affected by the proposed Project or Project Variant. Spawning habitat is located much further upstream in Laguna Creek and on the tributaries of Spring and Fault creeks and all of this habitat is well upstream of the maximum water surface elevation of 291.8 feet. Operating the reservoir to 291.8 feet or 287.8 feet for the proposed Project or Project Variant respectively, would have no impact trout spawning habitat within the Laguna Creek system for rainbow trout in UCSR.



Lower Crystal Springs Dam Improvements Project

Upper San Mateo Creek - Stream Elevation Profile Showing the Distribution of 2007 Redds and the Inundation Zone Between 283.8 feet and 291.8 feet

Figure 5.1

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Laguna Creek supports no year-round rearing habitat within the existing Inundation Reach or the other reaches that are accessible to rainbow trout from UCSR under existing conditions. Potential rearing habitat was only found on Spring Creek. Previously, juvenile trout have been found downstream of the barrier in Spring Creek in wetter years. Operating the reservoir to 291.8 feet or 287.8 feet for the proposed Project or Project Variant respectively, would have no impact on trout rearing habitat within the Laguna Creek system for rainbow trout in UCSR.

Outmigration conditions in the Laguna Creek system most likely vary dramatically depending on the Water Year Type and because of the dry nature of these streams, rainbow trout fry need to make it to the reservoir to survive. Operating the reservoir to the proposed Project level of 291.8 feet or to the Project Variant level of 287.8 feet by February of each year and maintaining that level until early July would improve outmigration conditions in Laguna Creek by keeping more of the lower Laguna Creek channel wetted to facilitate fry movement into UCSR. Either of these operations would likely be a benefit of the project by improving outmigration conditions from Laguna Creek to UCSR.

5.3 Lower San Mateo Creek

The field survey habitat typed about 15 percent of the length of San Mateo Creek between the LCSD and South San Francisco Bay and included most of the channel within SFPUC ownership.

Dam safety requirements mandate construction of an enlarged stilling basin and erosion control area at the base of the CSD. Construction of these facilities will result in removing all existing habitat to the downstream edge of Pool #1. Construction of the stilling basin and placement of the rip rap erosion control material is estimated to take 18 months. Habitat lost includes a riparian woodland between the existing stilling basin down to and including Pool #1. This pool is sustained by seepage and leakage and may provide some habitat that would support rainbow trout rearing habitat, but there is no spawning upstream of the I-280 bridge because habitat would not support spawning since it is composed of pools or shallow channels without adequate gravel.

There were seven potential spawning sites located between the Intersection of Crystal Springs and Polhemus roads and I-280. The total area of potential spawning substrate was estimated at 951 square feet with individual sites ranging in size from 500 to 16 square feet. No potential spawning areas were identified within a half mile of the dam (Figure 4.5).

There is a healthy native fish community occupying Lower San Mateo Creek. Habitat conditions are good and base flows are adequate to support the native fish community. At least three rainbow trout age groups were collected from the creek. Young of the year rainbow trout/steelhead were present at all sampling sites with the highest catch occurring at the site closest to I-280. The only potential barrier noted in the creek was the box culvert beneath Crystal Springs Road at the intersection with Polhemus Road. We have not verified passage conditions for the section of creek beneath the town of San Mateo. Reproduction is occurring successfully in San Mateo Creek and young rainbow trout/steelhead are growing to large sizes in the creek.

Habitat to support steelhead/rainbow trout is in good to fair condition throughout Lower San Mateo Creek from about a mile downstream of the dam to De Anza Park. In the foothill reach, the channel is encroached by Crystal Springs Road, the SFPUC pipeline and a sewer line and intermittently by retaining walls protecting one or more of these structures. Several tributaries contribute flow to the channel in the foothill reach. Flows in Lower San Mateo Creek were estimated to be between 0.6 to 1 cfs below Pool #2 and 2-3 cfs at the lower end of the foothill reach.

Lower San Mateo Creek habitat includes numerous, good quality pools up to four to five feet deep with good riparian shading along most of the foothill reach. Rainbow trout/steelhead were observed downstream as far as De Anza Park. Young-of-the-year trout (less than 100mm in size) were abundant at many locations visited and occasional large juveniles were also observed. In the valley reach, there are several areas of degraded habitat either in flood control channels (one along El Cerrito Drive) and the other beneath the City of San Mateo. Overall habitat appears suitable to support steelhead in the foothill and western portion of the valley reaches of Lower San Mateo Creek.

The only passage barrier observed during field investigations was the box culvert beneath Crystal Springs Road near Polhemus Road. At base flow conditions this site would not provide enough depth of flow to support the passage of adult steelhead, and during high flows a velocity barrier likely develops, but there are probably intermediate flow conditions when access is possible. There is good habitat to support spawning and rearing in the Lower San Mateo Creek downstream of this road crossing to De Anza Park, a distance of about 3 miles.

6.0 REFERENCES

Environmental Science Associates (ESA). 1994. San Francisco Watershed Management Plan. Peninsula Watershed Natural and Cultural Resources. Unpublished report prepared for EDAW under contract to the San Francisco Water Department.

Flosi, G, S. Downie, J. Hopelain, M. Bird, R. Coey, and B. Collins. 1998. California Salmonid Stream Habitat Restoration Manual, Third Edition, California Department of Fish and Game.

Kline, K.F., 2000. Brief Biological Assessment for Lower Crystal Springs Dam Energy Dissipater. Report of Lower San Mateo Creek survey conducted 21, November 2000., EA Engineering

Leidy, R. A., USEPA. 2002. Unpublished stream survey data 1992-2002.

Schoenfisch, Marianne, 2007. Docent with the Filoli Environmental Education School, personal conversation with A.Brinkerhoff and T. Taylor, November 1, 2007.

Susoeff, Connie, 2008. Personal communication with A. Brinkerhoff, May 13, 2008.

San Francisco Public Utilities Commission (SFPUC). 2008. Memo RE: Lower Crystal Springs Reservoir – Request for Information Response.

Smith, J. J. 1991. Summary of fish sampling results for the streams of San Francisco Water Department's peninsula watershed lands (near Crystal Springs Reservoir). SFWD.

Wolman, M.G. 1954. A method of sampling coarse river-bed material. Transactions American Geophysical Union 35:951-956.

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APPENDIX L

Blasting/Noise Impacts on Fish

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MEMORANDUM

18 September 2009

To: Joyce Hsiao, Orion Environmental
From: Deborah Jue, Wilson, Ihrig (WIA)
cc: Tasso Mavroudis, SFPUC

Subject: Potential Blasting Impacts on Fish at Lower Crystal Springs Dam (LCSD)

As requested, WIA has prepared this memorandum for the environmental analysis of the Lower Crystal Springs Dam Improvements (LCSDI) project in San Mateo County, California.

Controlled detonations (blasting) is one technique that may be used to break apart rock or concrete for the demolition of the existing stilling basin and excavation for the proposed larger stilling basin at the toe of the Lower Crystal Springs Dam (LCSD). Blasting for the LCSDI project would be a last resort measure that would be used for unforeseen conditions where and if all other demolition methods called for do not allow for the timely demolition of the work. However, in order to provide the most conservative analysis of potential environmental impacts, this memorandum analyzes the effects of potential blasting at LCSD.

Blasting could be used to remove approximate 3-foot layers of rock or concrete. As an example, 1.5 inch diameter holes could be drilled in a particular pattern determined by the blasting specialist, and these holes would be filled with a specified amount of explosives and wired for detonation. Once the area is prepared, a chain link fence and a blast mat (rubber belting) would be placed over the area. Warning horns would sound to alert the community before detonation. Blasting is usually over in a matter of seconds. The contractor could use up to 150 pounds of explosive per blast and anywhere from 0.5 to 9 pounds per 8 millisecond delay[1]. Once the blast is over, an all clear horn would be sounded. Concrete or rock would then be removed using an excavator.

Blasting would occur during normal work hours (between 7 am and 5 pm). With two construction shifts there would be 2 to 3 blasts per day. A potential blasting work schedule would require drilling until 7 am and blasting shortly after 7 am. This would be followed by excavation and one more drill/blast cycle before 5 pm, with excavation and drilling continuing after 5 pm. Approximately 100 to 150 cubic yards of concrete could be removed per day with this technique.

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[1] For the purposes of evaluating construction-related blasting vibration, only the total explosive charge within an 8 millisecond time "delay" is considered, since the total amount of explosive charge per detonation can be divided in a number of delay groupings.

Recent SFPUC experience for construction of the New Crystal Springs Bypass Tunnel (NCSBT) suggests that the National Marine Fisheries Service (NMFS) would require a criterion limit of 100kPa (220 dB) peak sound pressure level and 187 dB SEL[2] for underwater sound pressure levels at fish habitats in the nearby pool between December 1 and May 31 to avoid detrimental effects on fish.

Shown in Figure 1 is the typical range[3] of ground vibration expected from confined blasting, plotting the scaled distance[4] vs. the peak vibration velocity. Thus, for a charge weight of 20 lb per delay, the scaled distance at 2,000 ft would be 447 ft/lb$^{1/2}$ and the expected peak particle vibration would be approximately 0.02 in/sec.

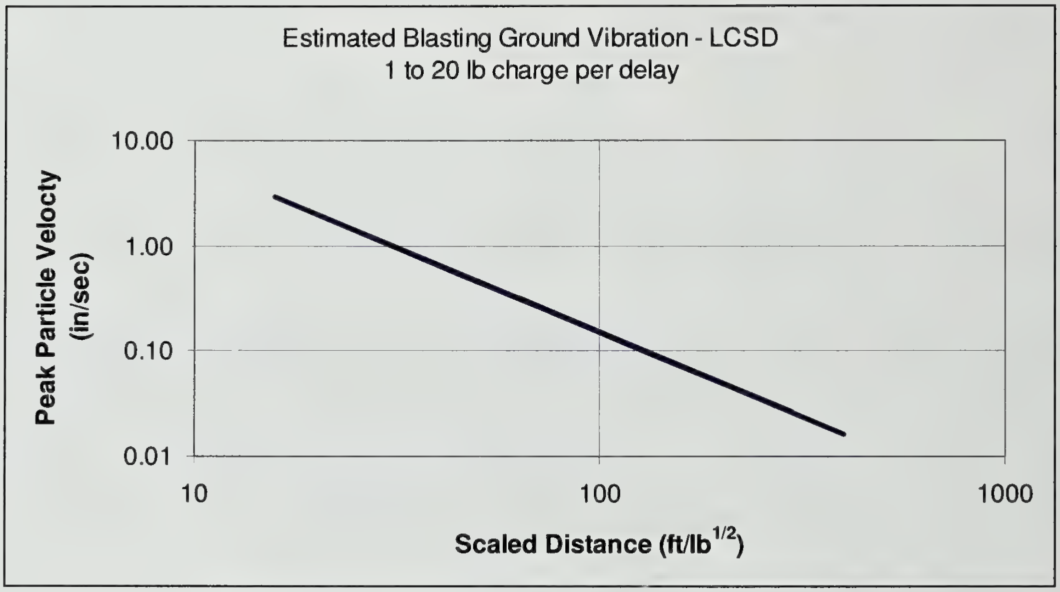

FIGURE 1 Estimated Ground Vibration from Controlled Detonations (Confined)

The closest site where fish would inhabit during this phase of the work is Pool 2 in San Mateo Creek approximately 220 to 330 feet from the stilling basin work area and the closest area of fish eggs would be found at the closest spawning area, approximately 2,000 feet from the basin work area. (See circled areas in Figure 2.) Since the LCSD work area would not be acoustically coupled to these areas, the underwater sound pressure level would be caused by the transmission of energy from ground vibration.

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[2] Sound Exposure Level (SEL), is a metric which quantifies the sound energy for a given event, normalized to a 1 second duration.

[3] Oriard, Lews, *The Effects of Vibration and Environmental Forces – A Guide for the Investigation of Structures*, International Society of Explosives Engineers, 1999.

[4] Scaled distance for blasting vibration is defined as the ratio of Distance (ft)/square root[Charge weight (lb)]

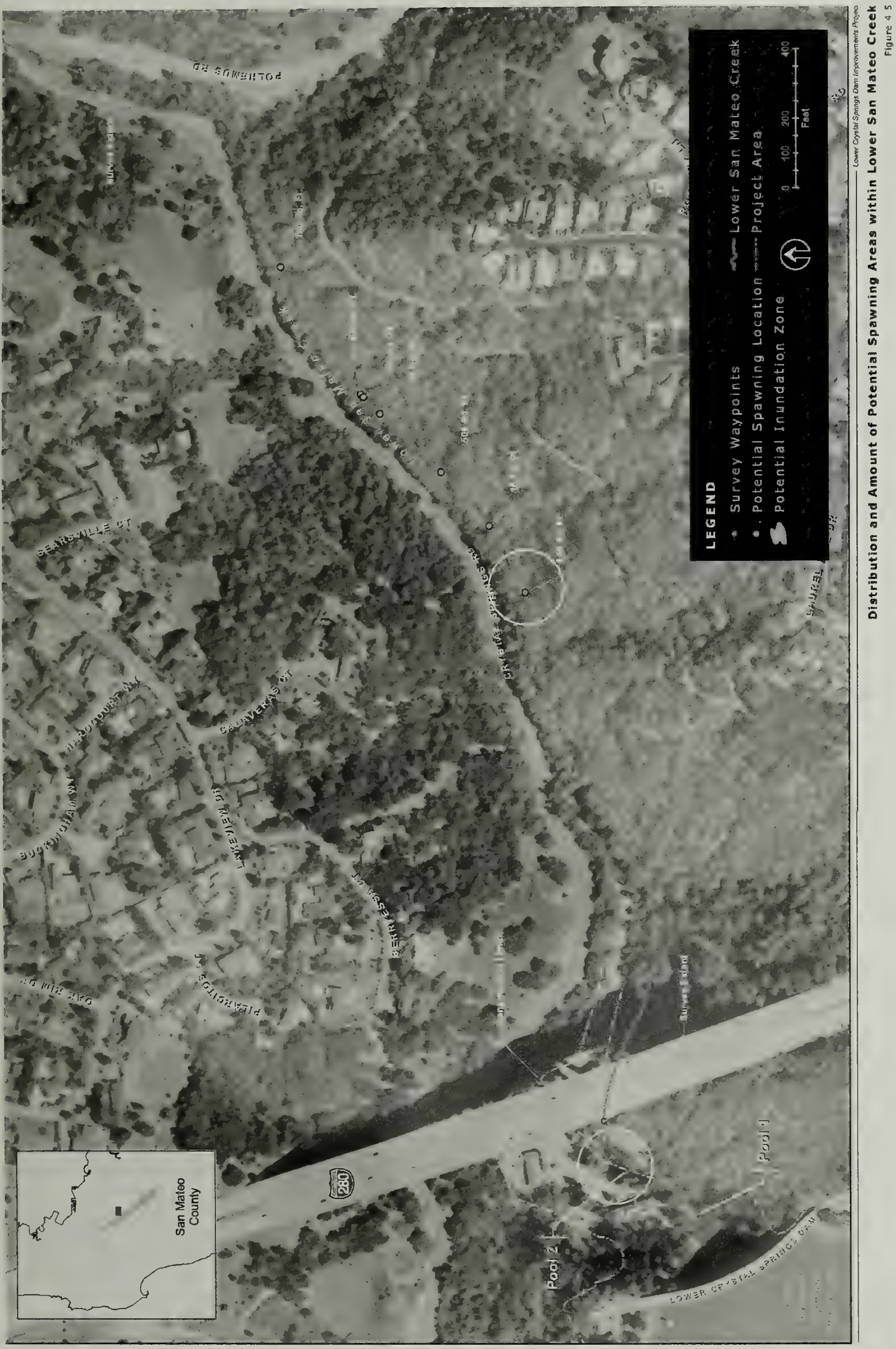

FIGURE 2 Fish Habitats, Lower San Mateo Creek (Entrix/MSE, Upper and Lower San Mateo and Laguna Creeks Fish Habitat Surveys, 2009)

Figure 3 illustrates the expected underwater peak sound pressure levels from controlled detonations near the LCSD assuming 20 lb charge per delay; lower charge weights would result in correspondingly lower sound pressure levels, and as noted above lesser charge weights per delay are expected. The lower range shown in Figure 3 represents the effect of a 20 dB transmission loss factor, based on underwater monitoring measurements conducted at the nearby NCSBT project in San Mateo Creek.

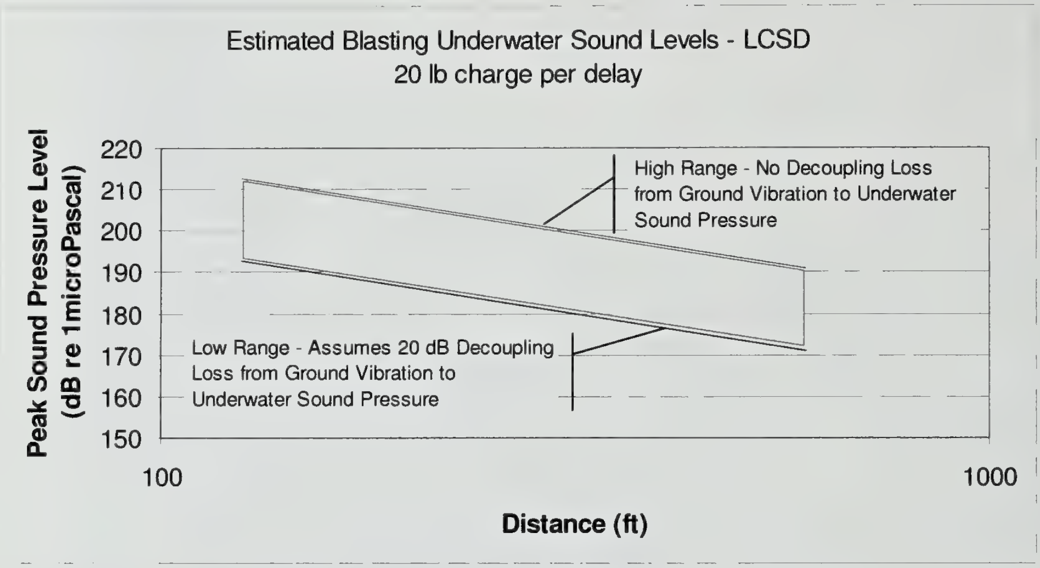

FIGURE 3 Estimated Underwater Sound from Blasting

Thus, at the nearest distance of 220 feet, with an explosive charge of 20 lb per delay, the peak underwater sound pressure level would range from 185 to 205 dB *re* 1 microPascal (1.8 to 17.8 kPa), which would comply with the NMFS requirements. Further, the blasting noise and vibration typically lasts on the order of a few seconds (e.g., 2 to 8 seconds), and based on the data reviewed from the NCSBT, typical SEL values should range from 157 to 185 dB, just within the 187 dB requirement.

In conclusion, with charge weights up to 20 lb per delay, it is expected that the underwater sound caused by controlled detonations near the LCSD would not exceed the criterion limits imposed by NMFS. Thus, based on current SFPUC experience at the NCSBT project, it appears that it would be feasible for the contractor to achieve the necessary excavation work with charge weights on the order of 20 lb per delay or less and comply with the NMFS limits should he decide to use this technique. Further, since vibration from blasting can be affected by local gelologic conditions, it is possible that charge weights even higher than 20 lb could be used and still meet the criteria; vibration monitoring should be conducted during blasting work to verify and validate the local conditions.

(End of Memorandum)

APPENDIX M

Supporting Documentation for Hydrology Analysis

1. Lower Crystal Springs Dam Improvements Project Variant Operation (Steiner, 2009)
2. Lower Crystal Springs Dam Improvements Project – Reservoir Water Surface Elevation Exceedences above 287.8 feet memorandum (ESA+Orion, 2009)
3. Flow Measurement and Seepage Estimation in San Mateo Creek Below Lower Crystal Springs Dam (Hydroconsult Engineers Inc., 2009)
4. Analysis of Unimpaired Inflow and Reservoir Levels in Crystal Springs Reservoir (Hydroconsult Engineers, Inc., 2009)
    a. Attachment A: Rainfall Analysis
    b. Attachment B: HEC-HMS Model Output
5. Adjustment of HH/LSM Model Results to Reflect Actual Operation of Crystal Springs Reservoir (Hydroconsult Engineers, Inc., 2009)
    a. Attachment A: SFPUC Memo from David Cameron, Operating Range of Crystal Springs Reservoir
    b. Attachment B: Adjustment HH/LSM Results, Method 1 – Monthly Scaling Methodology (SFPUC Method)
    c. Attachment C: Adjusted HH/LSM Results, Method 2 – Year Type Scaling Methodology
    d. HH/LSM Data Analysis, No Scaling

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APPENDIX

Memorandum

Subject: **Lower Crystal Springs Dam Improvement Project Variant Operation**
From: **Daniel B. Steiner**
Date: **January 25, 2009**

---

1. Introduction and Assumptions

The operation of the Lower Crystal Springs Dam and reservoir has been evaluated within the context of the San Francisco Public Utilities Commission's Water Supply Improvement Program (WSIP). That evaluation included modeled operations of the dam and reservoir under several conditions:

- The Baseline ("existing") Condition that assumed the existing system configuration and the baseline water system demand of 265 mgd. The Crystal Springs Reservoir (CSR) maximum operating elevation for this scenario was modeled as 283.8 ft/18.52 bg with a 2 bg winter buffer.

- The Proposed Project Condition and Modified WSIP Condition assuming future WSIP improvements to the system and the year 2030 water system customer purchase request of 300 mgd (net 290 mgd of water system demand), with a CSR maximum operating elevation modeled as 291.8 ft/22.15 bg with a 3.6 bg winter buffer for the Proposed Project and a CSR maximum operating elevation of 287.8 ft/20.28 bg. with a 2 bg winter buffer for the Modified WSIP scenario.

- The adopted Phased WSIP Variant ("2018 WSIP") assuming future WSIP improvements to the system with the water system customer purchase request limited by the terms of the existing Master Water Sales Agreement through 2018, assumed to amount to net 265 mgd of water system demand after an offset of 10 mgd of recycled water, groundwater, and conservation projects in San Francisco. The CSR maximum operating elevation was modeled as 291.8 ft/22.15 bg with a 3.6 bg winter buffer.

The operation of the dam and reservoir are simulated by the use of the Hetch Hetchy/Local Simulation Model (HH/LSM), which is a system-wide monthly time-step operations planning tool used by the SFPUC. HH/LSM uses a scenario-specific system configuration and system water demand over an 82-year historic hydrology (1921-2002) to project operations that might result if that 82-year hydrology reoccurred. The utility of model simulations is the comparison of results between different scenarios of system configuration, water demand and system operation.

The purpose of this memorandum is to present the results of an additional scenario, namely the Lower Crystal Springs Dam Improvement Project (LCSDI Project) variant that incorporates a "restricted" operation of the dam and reservoir into the adopted Phased WSIP Variant (2018 WSIP). The restricted operation of the dam and reservoir is modeled identical to the operation assumed in the Modified WSIP scenario, providing a CSR maximum operating elevation of 287.8 ft/20.28 bg. with a 2 bg winter buffer. All other system characteristics of this scenario are identical to the Phased WSIP Variant. Table 1-1 illustrates the basic underlying characteristics of the scenario in the context of the Baseline and 2018 WSIP.

APPENDIX

Table 1-1
Setting Characteristics and Modeling Assumptions

Assumptions and Characteristics of Setting and/or Program	Units	Baseline	WSIP Variant	LCSDIP Variant
		Baseline Conditions - Calaveras Constrained	**2018 WSIP**	**2018 Restricted Crystal Springs**
Time Horizon for Setting of Analysis / Date		2005	2018 / 2030	2018 / 2030
HH/LSM Simulation Study Name		Base1LT	2018WSIPLT	2018RestCSLT
System Wide Parameters				
Customer Purchase Request (Demand Level)	MGD	265	275 / 300	275 / 300
Demand Level Supplied from Other Sources				
Regional Recycled Water/Conservation/Groundwater in SF	MGD	0	10	10
Other Regional Recycled Water/Conservation/Groundwater	MGD	0	0	0
Demand Level Supplied from Tuolumne + Local Watersheds	MGD	265	265	265
Average Annual Deliveries and Supplies				
Deliveries from Tuolume + Local Watersheds (Average Annual)	MGD	258	262	262
Supply or Deliveries from Other Sources - Regional Recl/Cons/GW	MGD	0	10	10
Total Deliveries and Supply for Demand Level (Average Annual)	MGD	258	272	272
Features and Facilities				
Regional Reclaimed Water/Conservation/Groundwater - SF			●	●
Regional Reclaimed Water/Conservation/Groundwater - Other				
Calaveras Reservoir - 12.4 BG (Constrained)		●		
Calaveras Reservoir - 31.6 BG (Restored/Unconstrained)			●	●
Calaveras Reseroivr Release for Fish			●	●
Calaveras Reservoir Release for Fish & Flow Recapture			●	●
Alameda Creek Diversion Dam Bypass Flow & Recapture				
Pilarcitos Reservoir Pump for Creek Summer Release				
Crystal Springs Reservoir - 18.52 BG (Constrained)		●		
Crystal Springs Reservoir - 20.28 BG (Restricted)				●
Crystal Springs Reservoir - 22.15 BG (Restored/Unconstrained)			●	
Sunol Valley Water Treatment Plant Expansion			●	●
Sunol Valley Water Treatment Plant Feed from SJPL			●	●
Harry Tracy Water Treatment Plant Expansion			●	●
Bay Division Pipeline Increased Conveyance			●	●
San Joaquin Pipeline Increased Conveyance			●	●
Desalination Project				
Westside Groundwater Project			●	●
Tuolumne River Transfer			**2,300 (From Storage)**	**2,300 (From Storage)**
Local System Operational Parmeters				
Crystal Springs Reservoir Operation				
Storage - Minimum/Maximum	BG	5.4 - 18.52	5.4 - 22.15	5.4 - 20.28
	TAF	16.6 - 56.8	16.6 - 68.0	16.6 - 62.2
Fall/Winter Operation Storage		16.52 BG (50.7 TAF)	18.55 BG (56.9 TAF)	18.28 BG (56.1 TAF)
Stream Release		Up to 250 cfs to not exceed 18.52 BG	Up to 250 cfs to not exceed 21 BG	Up to 600 cfs to not exceed 20.28 BG

Refer to Program Environmental Impact Report Comments and Responses Volume 8 of 8, Appendix O (September 30, 2008) for additional information regarding definition of terms.

2. Analysis Results

The operation of the Lower Crystal Springs Dam and reservoir can be described by the storage of the reservoir as it balances inflows and outflows. The operation of Crystal Springs Reservoir storage among the three scenarios 1) Baseline, 2) Phased WSIP, and 3) Restricted Crystal Springs is illustrated in Figure 2-1 for the 82-years of monthly simulated operations. The results are also described in Table 2-1 for Baseline conditions, Table 2-2 for Phased WSIP conditions, and Table 2-3 for the Restricted Crystal Springs scenario.

Some caution is advised when using the absolute results from the model. For instance, in the Baseline simulation the February 1998 result indicates an exceedence of the assumed maximum storage in the reservoir. This result is a "modeling exception" caused by modeling limitations and would not be expected to occur in "real-time" operations. Likely, real-time information in that month or earlier would lead to actions by the operators to avoid the circumstance. These modeling exceptions are very rare in the study, but depending on the methods used for the analysis need to be recognized. Also, the simulations are the result of systematic model protocols that depict the operational assumptions (rules) that assumed within the model. Not all circumstances that could affect system operations are, or could be practicably modeled. For instance, an unexpected outage or an extension of an outage already assumed within the treatment or conveyance system could result in Crystal Springs Reservoir storage being drawn down (within a year) to a level lower than shown in the results. This potential variance from the modeled results should be considered within the analysis of anticipated operations.

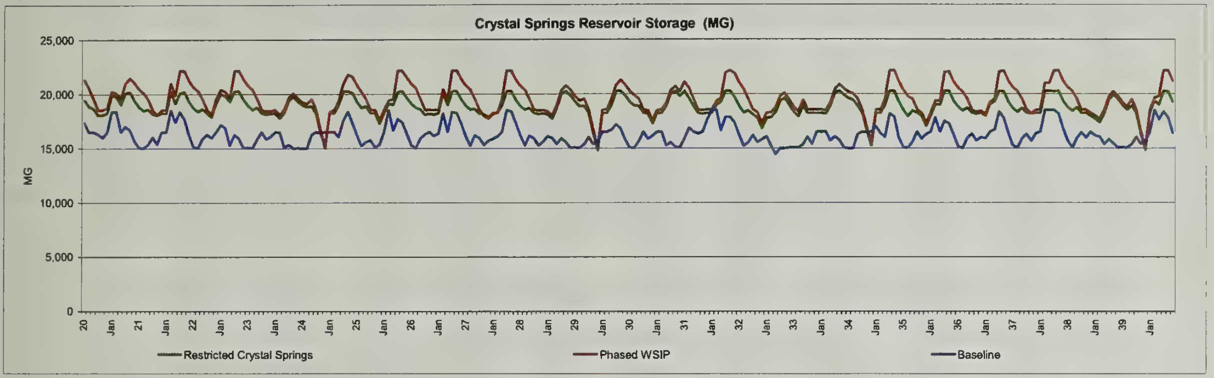
(Attached spreadsheet of results: LCSDIP Variant (Steiner_01_25_09).xls)

APPENDIX

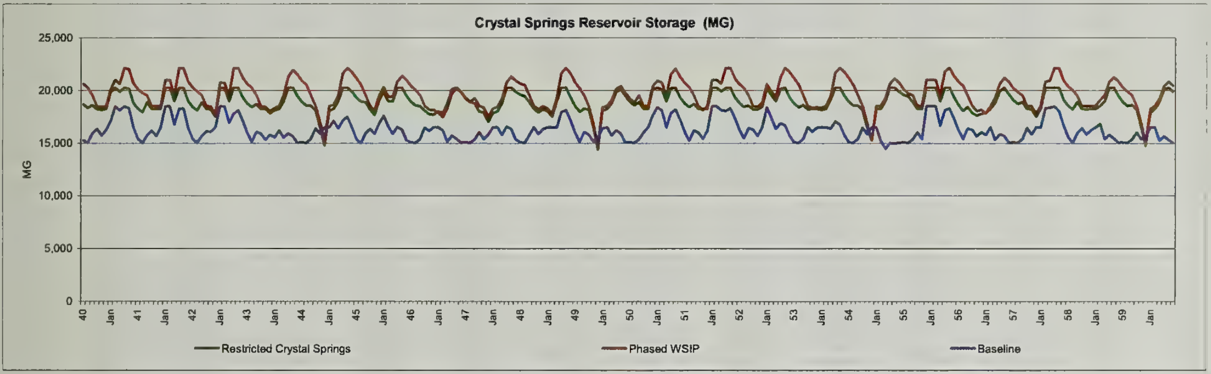
Figure 2-1
Crystal Springs Reservoir Storage

1920 - 1939

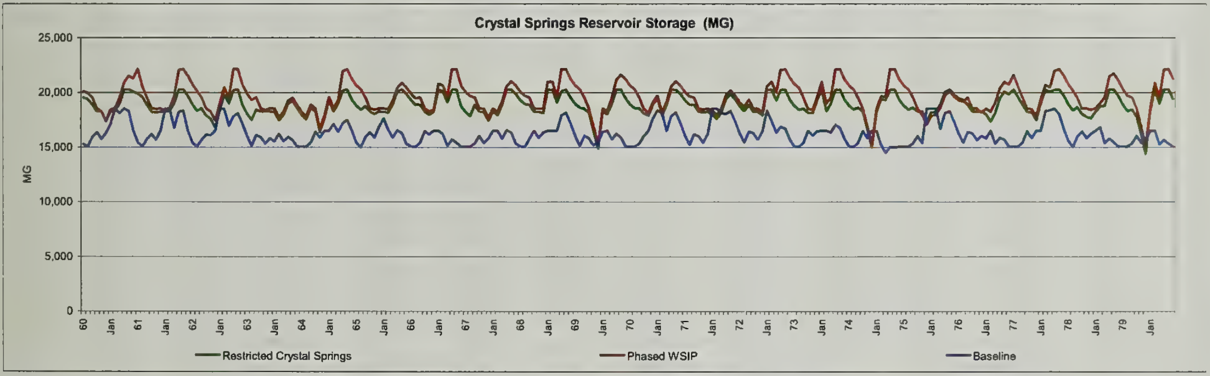
ac



1940 - 1959



1960 - 1979



1980 - 2002

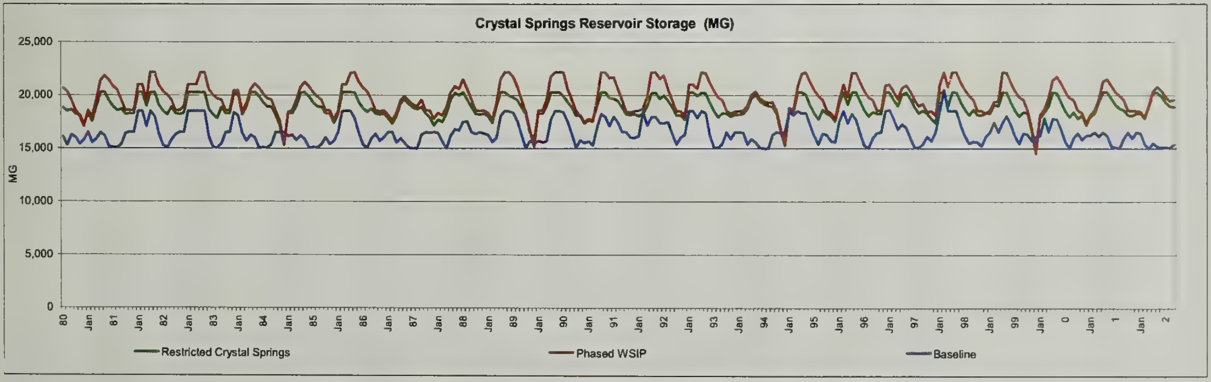


Table 2-1
Crystal Springs Reservoir Storage (MG) – Baseline

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	16,319	16,000	16,520	18,362	18,384	16,520	17,032	16,692	15,681	15,086	15,051	15,369
1922	16,044	15,398	16,520	16,520	18,520	17,414	18,393	17,689	16,244	15,141	15,051	15,885
1923	16,282	15,981	16,520	17,177	16,896	15,303	16,277	15,950	15,062	15,086	15,051	15,845
1924	16,520	15,862	16,084	16,520	16,482	15,057	15,349	15,000	15,062	15,000	15,000	16,280
1925	16,520	16,457	16,520	16,520	16,529	16,080	17,565	18,402	17,376	16,245	15,245	15,599
1926	15,765	15,117	15,355	16,520	18,520	16,662	17,714	17,421	16,414	15,299	15,020	15,925
1927	16,302	16,520	16,151	16,371	18,219	16,520	18,350	18,281	17,277	16,157	15,256	16,198
1928	15,963	15,318	15,703	15,883	16,083	16,520	18,520	18,401	17,353	16,230	15,270	16,159
1929	15,916	15,271	15,597	16,118	15,948	15,397	15,919	15,562	15,062	15,086	15,051	15,365
1930	16,036	15,387	15,626	16,520	16,520	16,717	17,182	16,824	15,802	15,086	15,051	15,662
1931	16,520	15,873	16,158	16,520	16,520	15,245	15,566	15,123	15,062	15,898	16,874	16,520
1932	16,347	16,520	17,651	18,520	18,520	16,653	17,870	17,893	17,337	16,209	15,211	15,524
1933	16,202	15,557	15,800	16,082	15,253	14,460	15,000	15,000	15,062	15,086	15,051	15,366
1934	16,036	15,387	16,520	16,520	16,520	15,700	16,100	15,721	15,062	15,000	15,000	16,284
1935	16,520	16,477	16,520	17,015	16,378	16,043	18,192	17,914	16,027	15,086	15,051	15,581
1936	16,520	15,875	16,288	16,520	17,827	16,520	17,508	17,271	16,271	15,160	15,010	15,953
1937	16,335	15,688	16,029	15,923	16,520	16,730	18,369	17,791	16,364	15,256	15,051	15,895
1938	16,314	15,679	16,374	16,520	18,520	18,520	18,520	18,171	16,795	15,696	15,047	15,954
1939	16,461	15,968	16,520	16,165	16,058	15,373	15,812	15,449	15,062	15,086	15,051	15,367
1940	16,037	15,388	15,626	16,520	18,520	17,656	18,378	17,800	16,397	15,294	15,051	15,929
1941	16,369	15,747	16,278	17,110	18,520	18,116	18,520	18,316	16,527	15,435	15,051	15,737
1942	16,215	15,685	16,520	18,520	18,520	16,778	18,267	18,326	16,490	15,390	15,051	15,673
1943	16,135	16,095	16,520	18,520	18,487	16,952	17,816	18,106	17,127	16,012	15,138	16,102
1944	15,919	15,342	15,820	15,547	16,217	15,542	15,934	15,649	15,062	15,086	15,051	15,426
1945	16,418	15,892	16,520	16,520	17,137	16,424	17,170	17,526	16,525	15,411	15,009	15,955
1946	16,366	15,891	16,881	17,618	16,590	15,898	16,557	16,299	15,309	15,086	15,051	15,411
1947	16,483	16,177	16,520	16,520	16,225	15,137	15,730	15,421	15,062	15,086	15,051	15,369
1948	16,044	15,407	15,822	16,520	16,520	15,793	16,573	16,361	15,354	15,086	15,051	15,783
1949	16,520	15,871	16,359	16,520	16,520	16,521	17,959	18,165	17,157	16,035	15,134	16,074
1950	15,827	15,179	15,539	16,427	16,520	15,735	16,241	15,915	15,062	15,086	15,051	15,366
1951	16,040	16,520	17,671	18,402	18,130	16,520	17,882	18,191	17,223	16,108	15,247	16,212
1952	16,018	15,427	16,232	18,520	18,520	18,149	18,056	18,323	17,390	16,284	15,470	16,443
1953	16,297	15,705	16,519	18,378	17,408	16,353	16,904	16,712	15,721	15,086	15,051	15,429
1954	16,520	16,087	16,470	16,520	16,520	16,374	17,068	16,770	15,770	15,086	15,051	15,427
1955	16,480	15,879	16,520	16,520	15,221	14,498	15,022	15,000	15,062	15,086	15,051	15,366
1956	16,037	15,392	18,520	18,520	18,520	16,674	18,143	18,294	17,357	16,251	15,432	16,405
1957	16,267	15,669	16,048	15,811	16,520	15,338	15,860	15,713	15,062	15,086	15,051	15,427
1958	16,450	15,838	16,520	16,520	18,313	18,382	18,520	18,024	16,683	15,590	15,039	15,965
1959	16,446	15,832	16,237	16,520	16,834	15,378	15,793	15,454	15,062	15,086	15,051	15,366
1960	16,040	15,391	15,634	16,520	16,520	15,253	15,664	15,314	15,062	15,000	15,000	16,283
1961	16,520	16,498	16,520	16,520	15,875	15,773	17,015	17,605	17,508	18,320	17,520	16,800
1962	16,535	16,218	15,988	16,127	18,290	17,425	18,029	18,106	17,254	16,127	15,254	16,207
1963	15,969	15,339	16,122	18,148	18,520	16,687	18,520	18,520	16,400	15,302	15,051	15,505
1964	16,520	16,520	16,520	16,520	15,630	14,811	15,267	15,000	15,062	15,086	15,051	15,366
1965	16,037	15,444	16,520	18,520	17,778	16,840	17,717	18,080	17,118	16,006	15,154	16,124
1966	15,954	16,072	16,520	16,388	16,202	15,372	15,757	15,399	15,062	15,086	15,051	15,366
1967	16,038	15,435	16,520	17,484	17,409	16,587	17,957	18,520	16,390	15,291	15,051	15,492
1968	16,520	15,917	16,520	16,520	15,966	15,432	15,989	15,701	15,062	15,086	15,051	15,425
1969	16,209	15,625	16,520	18,520	18,520	17,151	17,933	18,059	17,133	16,022	15,183	16,161
1970	15,997	15,396	16,211	18,402	17,514	16,520	17,532	17,369	16,363	15,250	15,013	15,949
1971	16,328	16,462	16,771	17,160	16,490	15,326	15,910	15,612	15,062	15,086	15,051	15,368
1972	16,125	15,485	16,520	16,520	16,316	15,023	15,414	15,025	15,062	15,086	15,051	15,365
1973	16,039	16,520	16,520	17,257	18,520	17,541	18,156	18,226	17,256	16,143	15,285	16,263
1974	16,123	15,731	16,859	18,402	17,267	16,520	18,425	17,999	16,674	15,591	15,034	15,946
1975	16,428	15,875	16,520	16,489	18,520	18,520	18,520	18,069	16,717	15,629	15,034	15,996
1976	16,498	15,918	16,310	16,520	16,520	15,240	15,571	15,124	15,062	15,000	15,000	16,284
1977	16,520	16,463	16,520	16,520	16,520	15,600	16,776	17,350	17,247	18,057	17,520	16,260
1978	15,010	15,651	15,558	18,520	18,520	18,356	18,520	18,278	16,177	15,078	15,051	15,504
1979	16,520	15,899	16,235	16,520	16,976	16,484	17,654	17,512	16,496	15,381	15,021	15,935
1980	16,338	15,806	16,146	18,402	18,520	16,821	18,065	18,178	17,222	16,114	15,283	16,251
1981	16,047	15,407	15,792	16,520	15,523	15,881	16,502	16,170	15,166	15,086	15,051	15,404
1982	16,419	16,520	16,520	18,520	18,520	17,053	18,520	18,011	16,361	15,269	15,051	15,814
1983	16,277	16,520	16,520	18,520	18,520	18,520	18,520	18,498	16,073	15,086	15,051	15,441
1984	16,520	16,520	18,370	18,097	16,429	15,686	16,242	16,018	15,035	15,086	15,051	15,370
1985	16,500	16,520	16,520	16,144	16,256	15,787	16,195	15,858	15,062	15,086	15,051	15,368
1986	16,039	15,407	15,698	16,509	18,520	18,520	18,520	17,810	16,418	15,319	15,051	15,934
1987	16,355	15,710	16,035	16,520	16,520	15,539	15,934	15,485	15,062	15,000	15,000	16,283
1988	16,520	16,461	16,520	16,462	15,648	15,000	16,201	16,782	16,688	17,507	17,520	16,520
1989	16,347	16,520	16,391	16,236	15,617	15,998	18,059	18,520	18,478	18,348	17,520	16,267
1990	15,018	15,708	15,484	15,721	15,572	15,699	17,715	18,520	18,520	18,391	17,520	16,348
1991	15,096	15,743	15,519	15,654	15,275	16,912	18,243	17,965	17,097	17,978	17,446	16,555
1992	16,520	16,021	15,983	16,163	18,472	17,161	17,935	17,971	17,417	17,366	17,462	16,375
1993	15,398	16,033	16,283	18,520	18,520	17,854	18,520	18,329	16,173	15,070	15,051	15,453
1994	16,520	15,902	16,520	16,520	16,465	15,419	15,868	15,556	15,062	15,000	15,000	16,284
1995	16,520	16,475	16,520	18,520	18,131	18,520	18,303	18,348	17,216	16,157	15,389	16,405
1996	16,261	15,674	15,590	17,566	18,520	17,366	18,265	17,694	16,367	15,275	15,038	15,974
1997	16,461	16,520	18,520	18,613	17,800	16,809	17,287	16,943	15,949	15,086	15,051	15,421
1998	16,108	15,701	16,520	18,520	20,507	18,520	18,520	18,520	17,184	16,173	15,452	15,638
1999	15,597	15,219	16,092	16,516	17,439	16,520	17,428	18,038	17,230	16,135	15,456	16,439
2000	16,277	15,736	16,090	16,160	17,847	16,535	17,791	17,722	16,736	15,633	15,000	15,995
2001	16,416	15,818	16,193	16,228	16,520	16,111	16,529	16,191	15,186	15,086	15,026	15,922
2002	16,520	15,925	16,520	16,401	15,344	14,994	15,494	15,163	15,062	15,086	15,051	15,365
Avg (21-02)	16,217	15,867	16,358	17,012	17,199	16,407	17,203	17,074	16,179	15,628	15,324	15,854
Max (21-02)	16,535	16,520	18,520	18,613	20,507	18,520	18,520	18,520	18,520	18,391	17,520	16,800
Min (21-02)	15,010	15,117	15,355	15,547	15,221	14,460	15,000	15,000	15,035	15,000	15,000	15,365

Table 2-2
Crystal Springs Reservoir Storage (MG) – Phased WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	18,550	18,550	18,757	20,239	20,095	19,543	21,008	21,461	21,053	20,471	20,107	19,550
1922	18,550	18,044	18,519	18,550	21,000	19,884	22,150	22,150	21,222	20,645	20,284	19,550
1923	18,521	18,150	19,584	20,419	20,223	19,676	22,137	22,150	21,370	20,786	20,420	19,521
1924	18,550	18,422	18,476	18,550	18,072	18,599	19,712	20,060	19,586	19,245	19,096	19,550
1925	18,550	16,658	15,040	18,380	18,550	19,391	20,955	21,797	21,627	20,809	20,216	19,550
1926	18,550	18,550	17,568	18,550	19,410	19,551	22,150	22,150	21,540	20,951	20,550	19,540
1927	18,550	18,550	18,550	18,550	20,435	19,550	22,150	22,150	21,364	20,783	20,419	19,550
1928	18,550	17,970	17,748	18,169	18,311	19,550	22,150	22,150	21,332	20,747	20,381	19,507
1929	18,550	18,458	18,516	18,419	18,012	18,983	20,321	20,776	20,380	19,794	19,370	19,550
1930	18,550	16,718	15,083	18,527	18,550	19,550	20,823	21,274	20,856	20,268	19,904	19,550
1931	18,550	18,477	17,552	18,505	18,550	19,187	20,323	20,687	20,220	21,096	20,550	19,550
1932	18,550	18,489	18,550	18,550	19,327	19,615	21,935	22,150	21,874	21,055	20,438	19,550
1933	18,550	18,308	17,298	18,252	18,283	18,782	19,837	20,093	19,421	18,783	18,367	19,451
1934	18,550	18,550	18,550	18,550	18,493	19,229	20,442	20,870	20,471	20,181	20,029	19,550
1935	18,550	16,907	15,530	18,550	18,550	19,550	22,150	22,150	21,158	20,349	19,763	19,550
1936	18,550	18,250	17,318	18,271	19,352	19,356	21,987	22,050	21,137	20,553	20,189	19,550
1937	18,502	18,340	18,431	18,129	19,246	19,550	22,039	22,128	21,180	20,599	20,238	19,550
1938	18,550	18,205	18,510	18,550	21,000	21,000	22,150	22,150	21,194	20,624	20,267	19,550
1939	18,528	18,550	18,249	18,006	17,676	18,505	19,753	20,199	19,807	19,218	18,802	19,494
1940	18,550	16,618	15,082	18,550	19,652	19,790	22,150	22,150	21,211	20,635	20,275	19,550
1941	18,523	18,434	18,550	20,137	21,000	20,614	22,150	22,019	20,675	20,113	19,763	19,550
1942	18,550	18,550	18,545	21,000	21,000	19,539	22,150	22,101	20,853	20,283	19,927	19,550
1943	18,550	18,482	17,763	20,755	20,720	19,550	22,150	22,150	21,205	20,625	20,264	19,550
1944	18,512	18,453	18,025	18,308	18,550	19,550	21,348	21,929	21,530	20,940	20,550	19,550
1945	18,550	16,977	15,231	18,542	18,653	19,550	21,633	22,150	21,759	21,171	20,550	19,550
1946	18,550	18,129	19,529	20,321	19,429	19,417	20,860	21,392	21,005	20,422	20,059	19,550
1947	18,550	18,182	18,166	17,885	17,459	18,350	19,728	20,219	19,834	19,258	18,887	19,280
1948	18,550	18,383	17,465	18,287	18,443	19,232	20,769	21,340	20,939	20,659	20,506	19,550
1949	18,550	18,204	18,515	18,294	17,825	19,318	21,615	22,150	21,605	20,792	20,202	19,550
1950	18,550	16,845	14,727	18,419	18,550	19,065	20,151	20,404	19,792	19,214	18,857	19,550
1951	18,550	18,550	20,389	20,937	20,767	19,550	21,551	22,062	21,294	20,716	20,354	19,550
1952	18,550	18,106	18,550	21,000	21,000	20,647	22,150	22,128	21,173	20,603	20,247	19,550
1953	18,519	18,455	18,845	20,589	19,937	19,381	21,240	22,150	21,760	21,173	20,550	19,550
1954	18,550	18,333	18,432	18,343	18,550	19,423	21,679	22,150	21,753	21,163	20,550	19,550
1955	18,550	16,940	15,266	18,550	18,550	19,321	20,632	21,137	20,740	20,138	19,715	19,550
1956	18,550	18,550	21,000	21,000	21,000	19,538	21,820	22,150	21,394	20,823	20,465	19,534
1957	18,550	18,059	18,156	17,840	18,477	19,273	20,587	21,210	20,815	20,229	19,867	19,550
1958	18,550	18,510	17,773	18,550	20,854	20,942	22,150	22,120	20,948	20,385	20,031	19,550
1959	18,550	18,508	18,550	18,550	19,088	19,550	20,808	21,267	20,867	20,279	19,902	19,550
1960	18,550	16,929	15,086	18,242	18,550	19,190	20,410	20,860	20,454	20,112	19,960	19,550
1961	18,550	18,240	17,369	18,423	18,550	19,498	20,920	21,516	21,284	22,150	20,550	19,550
1962	18,550	18,490	18,550	18,274	18,547	19,679	22,072	22,150	21,547	20,732	20,142	19,535
1963	18,550	18,275	17,439	19,012	20,477	19,550	22,150	22,150	20,694	19,901	19,324	19,550
1964	18,550	18,393	18,550	18,523	17,738	18,216	19,260	19,511	18,848	18,216	17,805	18,892
1965	18,550	16,673	17,923	19,593	18,550	19,306	21,947	22,150	21,240	20,664	20,304	19,530
1966	18,550	18,451	18,550	18,550	18,486	19,241	20,439	20,883	20,486	19,900	19,477	19,550
1967	18,550	18,277	18,418	20,802	20,658	19,647	22,097	22,150	20,617	20,049	19,695	19,550
1968	18,550	18,520	17,721	18,550	18,241	19,201	20,545	21,050	20,657	20,074	19,713	19,550
1969	18,550	18,538	18,550	21,000	21,000	19,621	22,150	22,150	21,254	20,679	20,318	19,544
1970	18,550	16,938	15,273	18,550	18,327	19,550	21,171	21,646	21,254	20,668	20,305	19,550
1971	18,550	18,153	19,161	19,728	18,233	19,183	20,549	21,045	20,664	20,084	19,662	19,550
1972	18,550	18,480	18,550	18,360	17,960	18,585	19,789	20,209	19,748	19,105	18,683	19,374
1973	18,550	18,545	18,212	20,578	21,000	20,011	22,081	22,150	21,382	20,806	20,444	19,550
1974	18,502	18,436	19,603	21,000	19,037	19,550	22,150	22,150	21,211	20,655	20,298	19,543
1975	18,550	16,941	15,262	18,550	19,659	19,610	22,150	22,150	21,202	20,642	20,293	19,548
1976	18,550	17,985	17,070	17,874	17,994	18,612	19,759	20,123	19,656	19,319	19,173	19,550
1977	18,550	18,550	18,182	18,538	18,262	19,041	20,397	20,980	20,744	21,613	20,550	19,550
1978	18,550	18,490	17,834	19,431	20,700	20,473	21,986	22,150	21,583	20,781	20,196	19,550
1979	18,550	18,550	18,413	18,550	19,013	19,550	21,470	21,724	21,106	20,296	19,709	19,550
1980	18,550	16,910	15,132	18,550	20,872	19,545	22,094	22,150	21,259	20,687	20,327	19,545
1981	18,550	17,973	17,037	18,550	17,926	19,550	21,362	21,828	21,423	20,830	20,460	19,516
1982	18,550	18,550	18,550	21,000	21,000	19,575	22,150	22,150	20,916	20,351	19,998	19,550
1983	18,550	18,535	18,922	21,000	21,000	21,000	22,150	22,138	20,544	19,999	19,656	19,550
1984	18,550	18,550	20,444	20,451	18,429	19,176	20,521	21,081	20,701	20,122	19,702	19,550
1985	18,550	17,549	15,299	18,408	18,550	19,538	20,757	21,220	20,826	20,241	19,853	19,550
1986	18,550	18,550	17,666	18,493	21,000	21,000	22,059	22,150	21,245	20,672	20,313	19,535
1987	18,550	18,465	18,550	18,124	17,604	18,311	19,524	19,890	19,430	19,094	18,948	19,550
1988	18,550	18,550	17,766	18,314	18,095	18,857	20,233	20,819	20,587	21,459	20,550	19,550
1989	18,550	18,490	18,550	18,289	17,672	19,265	21,524	22,150	22,150	21,708	20,750	19,542
1990	18,433	16,714	15,145	18,550	18,550	19,550	21,768	22,150	22,150	22,150	20,550	19,550
1991	18,550	18,028	17,337	17,624	17,523	19,550	22,150	22,150	21,603	21,667	20,605	19,521
1992	18,429	18,376	18,483	18,550	18,722	19,852	22,150	22,150	21,547	21,853	20,550	19,513
1993	18,469	18,498	18,053	21,000	21,000	20,609	22,150	22,077	21,169	20,366	19,784	19,550
1994	18,550	18,289	18,448	18,470	18,550	19,015	20,052	20,316	19,701	19,428	19,282	19,338
1995	18,550	16,811	15,547	18,828	18,550	20,769	22,000	22,150	21,245	20,491	19,925	19,550
1996	18,550	18,318	17,797	19,602	21,000	19,836	22,063	22,089	21,170	20,379	19,799	19,550
1997	18,550	18,550	20,924	21,000	20,318	19,627	20,694	20,937	20,337	19,542	18,967	19,195
1998	18,399	18,487	18,106	20,958	22,150	20,770	22,150	22,150	21,212	20,500	19,957	19,550
1999	18,550	18,525	18,269	18,550	19,394	19,403	22,150	22,111	21,170	20,386	19,816	19,550
2000	18,550	16,919	14,799	18,138	18,650	19,733	21,410	21,722	21,125	20,329	19,747	19,550
2001	18,550	18,336	17,358	18,130	18,550	19,557	21,267	21,505	20,886	20,300	19,937	19,533
2002	18,550	18,528	18,510	18,432	17,926	19,038	20,332	20,799	20,406	19,820	19,446	19,550
Avg (21-02)	18,541	18,095	17,790	19,033	19,227	19,525	21,313	21,582	20,931	20,432	19,956	19,524
Max (21-02)	18,550	18,550	21,000	21,000	22,150	21,000	22,150	22,150	22,150	22,150	20,750	19,550
Min (21-02)	18,399	16,618	14,727	17,624	17,459	18,216	19,260	19,511	18,848	18,216	17,805	18,892

Table 2-3
Crystal Springs Reservoir Storage (MG) – Restricted Crystal Springs

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	18,057	18,094	18,280	19,941	19,798	19,063	20,140	20,196	19,408	18,840	18,488	18,630
1922	18,175	18,083	18,280	18,280	20,280	19,167	20,104	20,227	19,313	18,752	18,405	18,679
1923	18,241	17,914	19,219	20,055	19,860	19,314	20,280	20,280	19,514	18,945	18,593	18,789
1924	18,280	18,153	18,207	18,280	17,802	18,331	19,446	19,795	19,323	18,985	18,837	18,900
1925	18,280	16,389	15,374	18,280	18,280	19,000	20,280	20,280	20,124	19,318	18,736	18,900
1926	18,280	18,280	17,299	18,280	19,141	19,018	20,186	20,280	19,683	19,111	18,756	18,618
1927	18,107	18,208	18,125	18,280	20,165	18,990	20,257	20,280	19,508	18,942	18,592	18,666
1928	18,218	18,132	17,890	18,280	18,280	19,000	20,280	20,280	19,476	18,906	18,554	18,721
1929	18,265	18,174	18,233	18,135	17,729	18,701	20,041	20,280	19,888	19,308	18,887	18,900
1930	18,280	16,448	14,814	18,259	18,280	19,000	20,275	20,280	19,870	19,291	18,934	18,900
1931	18,280	18,208	17,283	18,237	18,280	18,918	20,056	20,280	19,816	20,280	19,600	18,900
1932	18,253	18,193	18,280	18,267	18,987	19,276	20,280	20,280	19,687	18,888	18,287	18,464
1933	18,124	17,821	16,846	17,799	17,831	18,331	19,390	19,649	18,980	18,346	17,933	18,900
1934	18,280	18,280	18,280	18,280	18,190	18,929	20,144	20,280	19,885	19,601	19,454	18,900
1935	18,280	16,628	15,261	18,280	18,280	19,000	20,280	20,280	19,302	18,508	17,935	18,477
1936	18,280	17,980	17,049	18,003	19,072	19,000	20,280	20,280	19,381	18,812	18,461	18,725
1937	18,272	18,181	18,273	17,971	19,088	19,315	20,280	20,226	19,264	18,699	18,352	18,708
1938	18,280	18,218	18,280	18,268	20,280	20,280	20,251	20,280	19,338	18,784	18,441	18,775
1939	18,280	18,280	17,975	17,726	17,396	18,226	19,476	19,923	19,533	18,947	18,533	18,900
1940	18,280	16,348	14,813	18,280	19,383	19,000	20,280	20,226	19,273	18,713	18,368	18,630
1941	18,236	18,187	18,280	19,868	20,280	19,897	20,280	20,161	18,832	18,286	17,949	18,900
1942	18,280	18,280	18,280	20,280	20,280	19,000	20,280	20,243	19,009	18,455	18,113	18,874
1943	18,280	18,213	17,529	20,280	20,246	19,000	20,280	20,280	19,349	18,785	18,438	18,709
1944	18,280	18,275	17,848	18,131	18,280	19,000	20,280	20,280	19,504	18,931	18,578	18,565
1945	18,105	16,509	14,788	18,100	18,280	19,000	20,280	20,280	19,903	19,330	18,975	18,900
1946	18,197	17,695	19,095	19,888	18,997	18,986	20,280	20,280	19,512	18,942	18,590	18,531
1947	18,102	17,771	17,726	18,033	17,879	18,765	20,140	20,280	19,894	19,318	18,946	18,770
1948	18,010	17,941	17,057	17,878	18,035	18,826	20,280	20,280	19,887	19,616	19,472	18,900
1949	18,280	17,935	18,246	18,025	17,557	19,012	20,280	20,280	19,353	18,559	17,986	18,289
1950	18,225	16,522	14,404	18,096	18,280	18,796	19,884	20,138	19,530	18,953	18,598	18,900
1951	18,280	18,280	20,119	20,280	20,111	18,982	20,219	20,274	19,346	18,784	18,437	18,736
1952	18,280	18,261	18,280	20,280	20,280	19,930	20,211	20,280	19,367	18,813	18,470	18,586
1953	18,228	18,209	18,464	20,209	19,557	19,000	20,171	20,280	19,339	18,771	18,422	18,633
1954	18,223	18,280	18,280	18,160	18,280	19,154	20,280	20,280	19,507	18,935	18,582	18,585
1955	18,127	16,496	15,271	18,280	18,280	19,000	20,280	20,280	19,890	19,603	19,457	18,900
1956	18,280	18,280	20,280	20,280	20,280	18,994	20,264	20,280	19,411	18,632	18,066	18,448
1957	17,874	17,633	17,817	17,883	18,263	18,836	19,936	20,280	19,675	19,100	18,745	18,900
1958	18,280	18,241	17,538	18,280	20,280	20,280	20,280	20,262	19,104	18,556	18,217	18,900
1959	18,280	18,239	18,280	18,280	18,557	19,000	20,260	20,280	19,498	18,922	18,555	18,647
1960	18,208	16,546	14,746	17,902	18,280	18,921	20,142	20,280	19,879	19,543	19,395	18,900
1961	18,280	18,280	17,409	18,280	18,280	19,000	20,280	20,280	20,058	19,915	19,600	18,881
1962	18,235	18,176	18,253	18,280	18,297	19,035	20,280	20,280	19,690	18,891	18,315	18,562
1963	17,890	17,616	16,782	18,356	19,823	19,000	20,217	20,280	18,838	18,061	17,497	18,437
1964	18,280	18,280	18,280	18,254	17,468	17,948	18,993	19,246	18,585	17,955	17,546	18,635
1965	18,280	16,403	17,655	19,325	18,280	19,000	20,189	20,280	19,356	18,795	18,449	18,762
1966	18,280	18,070	18,280	18,266	18,173	18,931	20,131	20,280	19,888	19,308	18,889	18,900
1967	18,280	17,975	18,280	20,280	20,138	19,128	20,280	20,280	18,761	18,209	17,868	18,900
1968	18,280	18,251	17,453	18,280	17,972	18,933	20,278	20,280	19,894	19,318	18,962	18,900
1969	18,280	18,269	18,161	20,280	20,280	19,097	20,136	20,280	19,541	18,981	18,632	18,538
1970	18,162	16,532	14,887	18,280	18,058	19,000	20,280	20,280	19,508	18,937	18,587	18,574
1971	18,119	17,927	18,936	19,504	17,972	18,922	20,280	20,280	19,906	19,333	18,916	18,900
1972	18,280	18,211	18,280	18,006	17,606	18,232	19,439	19,862	19,403	18,763	18,343	18,900
1973	18,280	18,276	17,929	20,280	20,280	19,294	20,280	20,252	19,353	18,793	18,446	18,534
1974	18,182	18,148	19,315	20,280	18,318	18,994	20,280	20,280	19,355	18,814	18,471	18,629
1975	18,277	16,669	14,990	18,280	19,390	19,342	20,280	20,280	19,345	18,801	18,466	18,653
1976	18,280	18,274	17,393	18,195	18,280	18,897	20,042	20,280	19,812	19,474	19,326	18,900
1977	18,280	18,280	18,280	18,015	17,344	18,128	19,489	20,080	19,851	20,280	19,600	18,900
1978	18,252	18,193	17,502	19,040	20,280	20,055	20,240	20,280	19,726	18,940	18,369	18,669
1979	18,049	17,786	17,650	18,280	18,744	18,766	20,280	20,280	19,673	18,875	18,299	18,453
1980	17,799	16,157	14,384	18,280	20,280	18,990	20,259	20,280	19,403	18,846	18,501	18,639
1981	18,223	18,151	17,249	18,280	17,540	19,000	20,280	20,280	19,498	18,921	18,565	18,700
1982	18,215	18,280	18,280	20,280	20,280	19,000	20,280	20,280	19,059	18,511	18,171	18,900
1983	18,280	18,224	18,332	20,280	20,280	20,280	20,280	20,270	18,691	18,162	17,833	18,900
1984	18,280	18,280	20,174	20,182	18,161	18,907	20,254	20,280	19,906	19,335	18,921	18,900
1985	18,152	17,152	15,316	18,280	18,280	19,000	20,221	20,280	19,893	19,317	18,935	18,900
1986	18,280	18,280	17,396	18,224	20,280	20,280	20,280	20,239	19,319	18,763	18,418	18,745
1987	18,280	18,192	18,280	17,854	17,330	18,038	19,253	19,621	19,162	18,828	18,685	18,900
1988	18,280	17,938	17,154	17,704	17,485	18,250	19,630	20,220	19,993	20,280	19,600	18,900
1989	18,253	18,194	18,280	18,019	17,403	18,997	20,280	20,280	19,940	19,795	19,522	18,865
1990	18,220	16,496	15,870	18,280	18,280	19,000	20,280	20,280	20,280	19,909	19,368	18,858
1991	18,106	18,138	17,481	17,766	17,665	19,000	20,280	20,280	19,747	19,671	19,462	18,861
1992	18,219	18,160	18,267	18,043	18,280	19,000	20,187	20,259	19,670	19,992	19,516	18,869
1993	18,122	18,148	17,703	20,280	20,280	19,942	20,249	20,188	19,294	18,508	17,939	18,324
1994	18,280	18,019	18,179	18,201	18,280	18,746	19,785	20,050	19,437	19,167	19,023	18,900
1995	18,280	16,542	15,279	18,560	18,280	20,280	20,280	20,046	19,042	18,306	17,757	18,642
1996	18,280	18,049	17,548	19,246	20,280	19,119	20,280	20,280	19,375	18,600	18,033	18,421
1997	18,280	18,268	20,280	20,280	19,599	19,000	20,070	20,280	19,686	18,896	18,326	18,558
1998	18,280	17,779	17,421	20,272	20,280	19,000	20,280	20,280	19,356	18,659	18,130	18,650
1999	18,170	18,146	18,280	18,280	19,125	19,000	20,280	20,253	19,326	18,557	18,002	18,437
2000	18,280	16,650	14,530	17,870	18,382	19,000	20,270	20,187	19,298	18,517	17,949	18,415
2001	17,779	18,139	17,195	17,966	18,280	19,344	20,280	20,280	19,670	19,096	18,742	18,608
2002	18,111	18,091	18,280	18,280	17,804	18,915	20,210	20,280	19,891	19,311	18,941	18,900
Avg (21-02)	18,214	17,816	17,528	18,708	18,827	19,049	20,143	20,217	19,510	18,990	18,598	18,733
Max (21-02)	18,280	18,280	20,280	20,280	20,280	20,280	20,280	20,280	20,280	20,280	19,600	18,900
Min (21-02)	17,779	16,157	14,384	17,704	17,330	17,948	18,993	19,246	18,585	17,955	17,497	18,289

memorandum

date Barbara Leitner

to John Davis

from 25 October 2009

subject Lower Crystal Springs Dam Improvement Project – Reservoir water surface elevation exceedences above 287.8 feet.

As you requested, I've described the circumstances under which the water surface elevation in Crystal Springs Reservoir would exceed elevation 287.8 feet. Particular attention is given to the frequency with which water surface elevations might exceed elevation 290 feet.

The operations memorandum prepared by David Briggs for Anna Roche (SFPUC, 16 September 2009) addresses both fairly frequent exceedences of elevation 287.8 feet as a result of normal reservoir operations and rare exceedences that might occur in very large storms. The two circumstances are described separately below

Exceedences Resulting from Normal Operations

In the operations memo, the second paragraph under "Future Operations" describes common or routine exceedences:

> *"As it does currently, the SFPUC would allow the water surface elevation to exceed the maximum normal water surface elevation occasionally. Water surface elevations would exceed 287.8 feet for short durations (up to 14 days) and up to elevation 291.8 feet during the rainy season (defined as November through April). Such exceedances would be expected to occur about one year in three and no more than 2 to 3 times in a single year. Exceedances could occur any time in the rainy season but would primarily occur after March 1 when the SFPUC begins eliminating the winter flood reservation as the rainy season ends."*

During most of the winter when the full two billion gallon flood reservation is in place the water surface elevation would be 283.3 feet. During this period it would take a 50-year return period storm or greater to raise the water level above 287.8 feet - exceedences would be very rare and even when they occurred would not raise the water surface elevation much above 287.8 feet.

There may be circumstances when the SFPUC is unable to maintain the full two billion gallon flood reservation during the winter months, for example, when a series of storms passes over the watershed or as a result of an operational problem. It is possible that a large storm might occur when there is only a one billion gallon flood reservation in place which corresponds with a water surface elevation of 285.5 feet. During such a time, it would take a 5-year return period storm or greater to raise the water surface elevation to 287.8 feet and a greater than 50-year return period storm to raise the water surface elevation above 290 feet. Thus, even with a reduced flood reservation in place, exceedences above 290 feet would be very rare.

During March when the flood reservation is not longer in place the water surface elevation would be 287.8 feet. Most storms occurring in March would add no more than 0.2 billion gallons to the reservoir and would only raise the water surface elevation by a few inches. The extra water would be pumped to San Andreas Reservoir over a 2 or 3 day period and the water level would be restored to 287.8 feet.

If a five-year return period storm occurred in March about 1.11 billion gallons would be added to the reservoir raising the water surface elevation to 290.2 feet. A five-year return period storm is a storm that has a one in five chance of occurring in any given year. However, because the Bay Area only receives significant rainfall in six months of the year any 5-year return period storm would occur in November, December, January, February, March or April. Thus, the probability of a five-year return period storm occurring in March is estimated to be one in 30 (5 times 6). This probability calculation conservatively assumes that there is an equal chance of a large storm occurring in any rainy season month. In fact, large storms are more likely to occur in the heart of the rainy season rather than on its shoulders and so the chance of a five-year return period storm occurring in March is less than 1:30.

The water added to the reservoir by a five-year return period storm in March (1 in 30 year probability event) would be pumped to San Andreas Reservoir with the water surface elevation reduced to elevation 290 feet in 2 to 3 days and to 287.8 feet in about 14 days. Thus, an oak at elevation 290 feet might be submerged for maybe 3 days once every 30 years. The above assumes that the SFPUC would stop deliveries from the Hetch Hetchy Aqueduct during the exceedence period. If deliveries continued the time taken for water levels to return to 287.8 feet would be greater.

Exceedences in Very Large Storms

In the operations memo, the second paragraph under "Future Operations" also describes common on fairly routine exceedences:

> *"In extreme and unlikely circumstances, such as a 100-year flood or back-to-back 50-year floods, particularly when the winter flood reservation is not in place, it is possible that the maximum target elevation of 287.8 feet may be exceeded for longer periods depending on the magnitude and duration of the events and the reservoir levels prior to the event. In these extreme circumstances, exceedances above 287.8 feet would be evacuated immediately by reducing or stopping inflow to CSR from the Hetch Hetchy Aqueduct, pumping up to 75 mgd of water from CSR to San Andreas Reservoir, if capacity is available in the latter, and/or discharging up to 600 cubic feet per second to San Mateo Creek as downstream conditions allow."*

It is improbable that a 100-year flood or two back-to-back 50-year floods would occur in March for the reasons noted above - no greater than a 1 in 300 year probability. Under these circumstances, the water surface elevation would rise to a few inches above the spillway elevation and water would flow over the spillway crest to lower San Mateo Creek. If the SFPUC releases water to lower San Mateo Creek through its piped system at 600 cfs the water level would be reduced to 290 feet in 2 to 3 days. An oak at an elevation of 290 feet would be submerged for 4 to 6 days every 300 years.

Subject:	**Flow Measurement and Seepage Estimation in San Mateo Creek Below Lower Crystal Springs Dam**
Job:	**Lower Crystal Springs Dam EIR**
Prepared By:	Brent Johnson, P.E.
Reviewed By:	Beth Goldstein, P.E., John Davis (Orion)
Date:	December 14, 2009
Reference:	070008, SFPUC Agreement No. CS-883A.7

1 INTRODUCTION

This memorandum describes flow measurements conducted by Hydroconsult on September 19, 2008 at the request of Entrix as part of the Lower Crystal Springs Dam (LCSD) EIR, a San Francisco Public Utilities Commission (SFPUC) project. The flow measurements were conducted in and adjacent to San Mateo Creek over a short reach below LCSD, extending from the first plunge pool (Pool #1) to a point approximately 900 feet downstream from the dam. Measurement of flow included estimation of discharge from pipelines from the Crystal Springs Pump Station to San Mateo Creek and other storm drain pipes discharging to the creek, as well as flow in the creek itself downstream of the pipes. Results of flow measurement were used to develop an approximation of the contribution to baseflow in San Mateo Creek below LCSD from pump station and stormwater pipelines discharging to the creek as well as dam seepage.

2 FLOW MEASUREMENT METHODOLOGY

Pipe flow and stream flow were measured on September 19, 2008 between 12:00 and 3:00 PM using a bucket and stop watch as described below. No substantial rainfall had occurred prior to the sampling event since April 24, 2008 as recorded at the Crystal Springs Cottage gage for a total of 148 antecedent dry days. Lower Crystal Springs Reservoir water surface elevation averaged approximately 271 feet (USGS NGVD 29) for the month of September 2008.

Pipe Flow Measurement

Flow was measured from all pipes discharging to San Mateo Creek below LCSD in the vicinity of Crystal Springs – San Andreas Pump Station. A total of 18 pipes were identified. The upstream-most pipe was the 24-in diameter stormdrain discharging to the stilling basin. The downstream-most pipe was the 24-in diameter stormdrain discharging upstream of the concrete piers for the I-280 overpass. Of the 18 pipes identified, 7 had measureable discharge. Figure 1 presents the location of the pipes identified during the study.

Pipe discharge was measured with a graduated bucket and stopwatch. Multiple measurements were performed and an average taken of successive measurements. Results of the bucket testing for each pipeline are presented below:

Table 1 Pipeline Bucket Test Results, September 19, 2008.

Pipe No (U/S to D/S)	Size (in)	Type	Dry/Flowing	Discharge Summary		Possible Source/Notes
				(gpm)	(cfs)	
1	18	Corr. Steel	Dry			Stormdrain
2	60	Steel	Flow	57.7	0.13	Res outlet
3	4	Steel/DIP	Flow	0.13	0.00	PS floor/roof drain
4	4	Steel/DIP	Dry			PS floor/roof drain
5	4	Steel/DIP	Dry			PS floor/roof drain
6	9	Corr. Steel	Flow	0.43	0.00	Rusted
7	12	Steel	Flow	0.43	0.00	Process Drain
8	8	Steel	Dry			Process Drain
9	24	Steel	Dry			PS Outlet
10	24	Steel	Dry			PS Outlet
11	24	Steel	Dry			PS Outlet
12	24	Steel	Flow	145	0.32	PS Outlet
13	12	Steel	Dry			Process Drain
14	12	Steel	Dry			Process Drain
15	12	Steel	Flow	58.0	0.13	Process Drain
16	18	Corr. Steel	Flow	5.80	0.01	SD
17	12	Corr. Steel	Dry			SD, Caltrans
18	24	Corr. Steel	Dry			SD, Caltrans
				267	0.60	

▨ Pipe dry at time of measurement

Q(total) **267** **gpm**
0.60 **cfs**

Streamflow Measurement

Streamflow was measured by temporarily damming flow in the creek and channeling the water through an orifice. Flow through the orifice was measured in the same manner as the pipes upstream, with a bucket and stopwatch. The streamflow measurement was performed downstream of the pipe measurement area at a point suitable to build the temporary dam and is shown on Figure 1. The streamflow measurement was performed approximately 350 feet downstream of stormdrain #18 and approximately 300 feet upstream of the USGS Gage. Results of the streamflow measurement are presented in Table 2.

Table 2 Streamflow Measurement Results, September 19, 2008

	Discharge	
Test	(gpm)	(cfs)
1	319	0.71
2	292	0.65
3	317	0.71
4	297	0.66
5	310	0.69
	307	0.68

Q(avg) **307** **gpm**
0.68 **cfs**

3 SUMMARY AND DISCUSSION OF FLOW MEASUREMENT

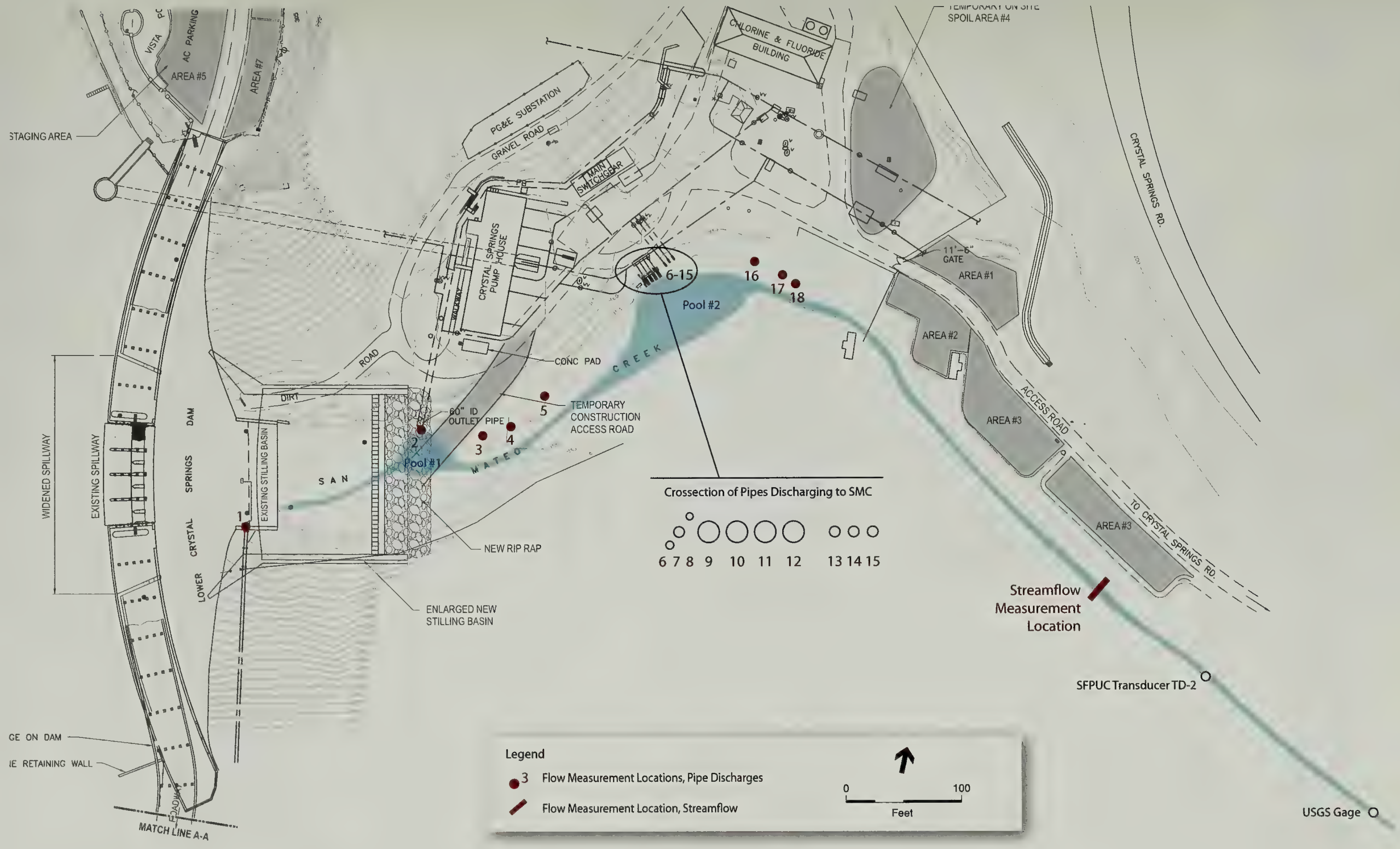
Stream flow in San Mateo Creek at the location indicated on Figure 1 was estimated as 0.68 cfs. The sum of all pipes discharging to the creek upstream of the stream flow measurement location was estimated as 0.60 cfs. No additional surface flows were noted upstream of the stream flow measurement location. The difference between the stream flow measurement and the summation of piped discharge flows was assumed to be the groundwater seepage contributing to base flow in San Mateo Creek in the vicinity of the base of the LCSD. Groundwater seepage was estimated to be 0.08 cfs, or 13% of the flow in the creek on September 19, 2008 as outlined in Table 3.

Table 3 Summary of Field Measurements & Calculated Dam Seepage, September 19, 2008

Item	Measured Discharge (cfs)	(gpm)	Notes
SMC	0.68	307	~200-300ft D/S of last Pipe, near TD-2
Sum of Pipes	0.60	267	Flow is primarily outlet/process flow (97%), minor contribution from SD's
Delta (GW)	**0.08**	**40**	Assumed GW seepage contributing to base flow in SMC

This mass balance methodology of flow measurement and groundwater seepage calculation was developed to provide an order of magnitude estimation of groundwater seepage in San Mateo Creek immediately below LCSD. The methodology employed for measuring pipe and stream flow in this study was quite accurate, however several potential improvements are possible to increase the accuracy of estimating dry weather groundwater seepage, as listed below:

1. Measure flow in shorter timeframe. Flow was measured over the course of several hours due to the size of the crew and time spent locating inputs to the creek. Pipe flow discharge to the creek appeared relatively consistent, however changes in flow over the period of study would introduce error into the calculation.
2. Record flow at multiple locations downstream. Measuring flow at multiple locations downstream of the piped discharge points would increase understanding of the streams interaction with groundwater. Flowrates may increase or drop with distance downstream, indicating a gaining or losing stream.
3. Coordinate with pump station operations to ensure discharge is not altered during the study. Similar to point 1, steady state discharge from piped sources during flow measurement is key to the mass balance approach of calculation.
4. Measure on multiple occasions. Measurement over the course of several days or months would increase the data set and accuracy of groundwater seepage estimation. Such measurements could also be checked against reservoir elevation to see if there is a correlation with groundwater seepage as well as with periods throughout the dry season.
5. Use USGS records as check on measurement. The recently installed USGS gage provides an additional data point to assist in a study such as this.
6. Record flow as close to the discharge point as possible. The stream flow measurement point for this study was conducted as near as possible to the discharge pipes for the methodology employed for calculating stream flow. However, another methodology, such as hand held flow metering, could be conducted closer to the piped discharges and may more accurately estimate groundwater seepage.



Source: URS 2009

SFPUC Lower Crystal Springs Dam Improvements

Figure 1
Flow Measurement Locations, September 19, 2008

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Technical Memorandum 2

Crystal Springs Reservoir Inflow Modeling

Subject:	**Analysis of Unimpaired Inflow and Reservoir Levels in Crystal Springs Reservoir**
Job	**Lower Crystal Springs Dam EIR**
Prepared By:	Brent Johnson, P.E., Chris Phanartzis, P.E.
Reviewed By:	Beth Goldstein, P.E., John Davis (Orion)
Date:	December 14, 2009
Reference:	070008, SFPUC Agreement No. CS-883A.7

1 INTRODUCTION

This memorandum outlines the results of the hydrologic modeling effort conducted by Hydroconsult Engineers (HCE) on behalf of the ESA Orion JV (the JV) for the Lower Crystal Springs Dam (LCSD) EIR, a San Francisco Public Utilities Commission (SFPUC) project. The analysis performed included hydrologic modeling of surface inflow to Lower and Upper Crystal Springs Reservoir (Crystal Springs Reservoir) from the contributing watershed over a range of rainfall conditions. The analysis utilized the HEC-HMS watershed model developed by the US Army Corps of Engineers. The ultimate goal of the modeling effort was to determine the effect of various storm events, ranging from 2 to 100-year recurrence probability, on water level in the reservoir under various operating scenarios.

Data and background documents relied upon to develop the model included:

- USGS contour maps used to establish sub-watershed boundaries
- Groundcover GIS data from the California Fire and Resource Assessment Program (FRAP)
- Soil type and slope GIS data from the NRCS Soil Survey (SSURGO)
- Rainfall data for rain gages within and adjacent to the study area supplied by the SFPUC
- Stage, storage and surface area data for Crystal Springs Reservoir supplied by the SFPUC
- Proposed spillway dimensions from the draft LCSD EIR project description.

Two scenarios were analyzed using the HEC-HMS model. For each scenario, system transfers into and out of the reservoir were assumed to be zero. Inflow to the reservoir was limited to inflow from the surrounding watershed and rainfall directly into the reservoir. Release from the reservoir was limited to releases or spills to San Mateo Creek. Evaporation and loss to groundwater were not included in the model. The results of the modeling effort for each scenario are summarized as estimates of the time the reservoir water surface would remain at or above various elevations for a given storm recurrence probability, ranging from 2-year to 100-year.

2 WATERSHED AND RESERVOIR SYSTEM

2.1 Crystal Springs Watershed

The Crystal Springs Reservoir watershed lies in steep, partially wooded terrain in the Santa Cruz Mountains and has a drainage area of 29.4 square miles. The highest elevations in the watershed are about 2,000 feet above sea level. The watershed follows the rift valley with a northwest to southeast orientation and is long and narrow in shape. The reservoir was formed by the damming of San Mateo Creek, which is the only perennial watercourse in the watershed. Two other creeks, San Andreas and Laguna Creeks, both ephemeral creeks, flow into the reservoir along with a number of intermittent drainages.

For this study, the watershed was subdivided into 16 subwatersheds as shown on Figure 1. Sub-watersheds 1 to 4 discharge to San Mateo Creek before entering the reservoir. Storm runoff also discharges directly into the reservoir from several of the sub-watersheds located around the reservoir's periphery. Some of the sub-watersheds have small perennial flows (baseflow).

Slopes

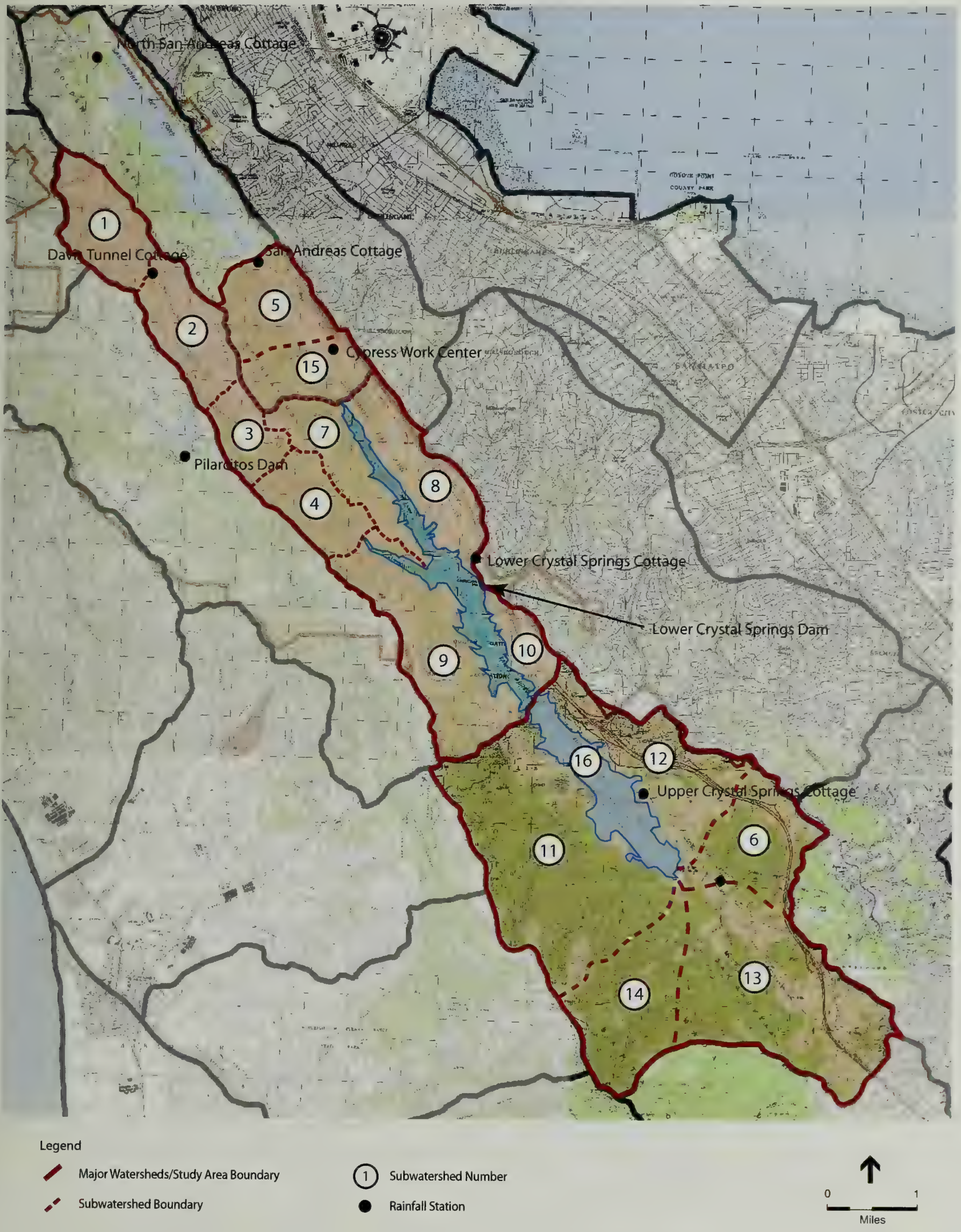
The sub-watersheds to the west and northwest of Crystal Springs Reservoir are characterized by higher elevations and steep slopes. Milder slopes predominate the area to the east and southeast of the reservoir. Subwatershed boundaries and reach slopes were derived from USGS contour maps and GIS data. The SSURGO dataset from the NRCS in GIS format was used to determine average slope in each of the subwatersheds. ESA GIS staff provided data from the SSURGO dataset.

Soil

The soil cover ranges from sandy to gravelly loams, clay, rock complexes and some urban fill material. SSURGO data in GIS format were used to determine the soil characteristics of each subarea. Hydrologic soil group ratings ranging from Type A to D were available for each of the SSURGO soil types and were entered into the HEC-HMS model. ESA GIS staff provided data from the SSURGO dataset and NRCS documents were reviewed to aid in correlating hydrologic soil group data with soil type information.

Groundcover

Groundcover data were taken from the California FRAP dataset. The FRAP dataset characterizes groundcover according to the dominant vegetation and land use, ranging from different types of forest and scrub, to pasture or grassland, to urban land. ESA GIS staff provided data from the California FRAP dataset broken out by subwatershed.



SFPUC Lower Crystal Springs Dam Improvements

HYDROCONSULT ENGINEERS, INC.

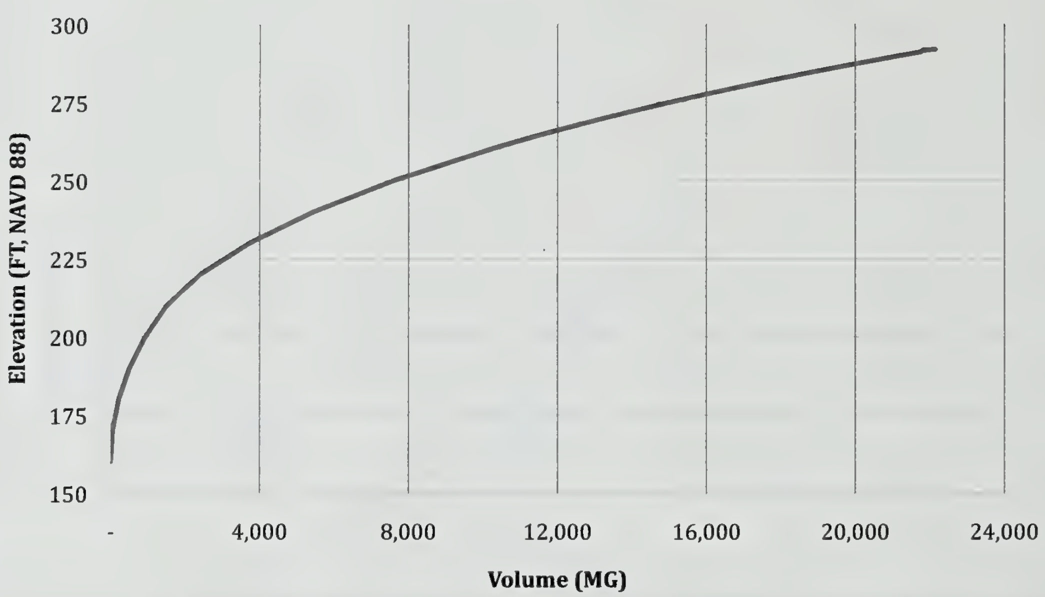
Figure 1

Study Area Watersheds, Subwatersheds and Rain Gages

2.2 Crystal Springs Reservoir

The Crystal Springs Reservoir lies within the San Andreas fault in the rift valley and thus has a long narrow shape oriented along the fault from northwest to southeast. Figure 2 presents the stage-storage curve for the reservoir.

Figure 2 - Crystal Springs Reservoir Stage-Storage Curve



Recent operation of the reservoir (1983 to present) has ranged from 245 to 283.8 feet. In 1983, the DSOD imposed a maximum operating water surface elevation of 283.8 until such time that spillway modifications are made, however brief exceedences of this elevation are allowed during wet weather events. Under future operation, the reservoir would typically be operated up to 287.8 feet, with periodic rises up to 291.8 feet. All modeling described in this document was performed assuming the LCSD improvement project has been completed.

2.3 Lower Crystal Springs Dam

All modeling assumed that the LCSD Improvement Project has been completed and that proposed improvements have been implemented. The current facility is a curved concrete gravity dam approximately 140 ft in height, with a total crest length of approximately 160 ft. There is a parapet wall built along the top of the dam crest with a gap in the middle of the dam at the spillway. The LCSD Improvement Project will modify the spillway of the dam by widening the spillway and stilling basin at the base of the dam. Spillway and elevation characteristics of the proposed project assumed for the model were:

Height of Future Spillway	291.8 ft
Type of Weir	Ogee
Height Toe-Crest	149 ft
Spillway Width at Top of Dam	206 ft
Spillway Width at Bottom of Dam	174.5 ft
Approximate Length of Spillway	171 ft

Outlet discharge from the reservoir is via penstock to a series of outlet pipes to San Mateo Creek below the LCSD. Modeled discharge ranged from 0 to 600 cfs. No modeling downstream of the outlet works was performed, nor were any capacity studies of San Mateo Creek below LCSD considered for this study. The maximum discharge value of 600 cfs was established with the ESA-Orion team.

3 MODELING METHODOLOGY

3.1 HEC -HMS

The hydrologic analysis was performed using by the HEC-HMS watershed model developed by the US Army Corps of Engineers.

The watershed was subdivided into 16 sub-watersheds as shown in Figure 1. Most of the subwatersheds discharge directly into the reservoir. The subwatersheds along San Mateo Creek were subdivided into four segments, numbered 1 through 4, for routing purposes due to the long flow route of the creek upstream of the reservoir. For the same reason a second sub-watershed on San Andreas Creek discharging into the northernmost end of the reservoir was sub-divided into two sub-watersheds numbered 5 and 15. For modeling purposes, the reservoir area was treated as sub-watershed number 16 with 100% of the rainfall resulting as runoff into the reservoir. Sub-watershed details are presented in Table 1.

Soil characteristics obtained from SSURGO Database (Info provided by ESA, GIS Analysis) were used to establish hydrologic soil groups for each sub-watershed. Ground cover information obtained from California FRAP dataset coupled with hydrologic soil group data from SSURGO was used to derive runoff curve number (CN) values. CN values, sub-watershed slopes and hydraulic lengths were used to calculate lag times for each sub-watershed (see Table 1).

Initial loss values given the model range from 0.2 inches to 0.4 inches under optimum antecedent conditions. Continuous loss was set at 0.05 inches per hour for all sub-watersheds.

The transformation of rainfall to runoff in the model was based on the Soil Conservation Service (SCS, now known as the NRCS) unit hydrograph and the lag times referred to above. Flow routing along stream reaches uses the kinematic wave method. Baseflow, where it exists, starts with an estimated initial discharge and a recession constant. Baseflow is not expected to have a significant impact on reservoir levels. Direct rainfall on the reservoir surface constitutes the inflow to sub-watershed number 16.

Table 1 – Subwatershed Details

HEC-HMS Subbasin #	Area sq. mi	Aver. Hydr. Length λ	SCS Curve No. CN	S**	Average ΔH (ft)*	Average Slope %	Lag hrs	Time of Conc.(T_c) hrs	Lag (min)	Raingage Weights Pilarcitos	Raingage Weights CS Res.
1	1.07	3000	71.3	4.03	500	16.67	0.24	0.402	14	1.0	0
2	1.07	2000	65.2	5.34	500	25.00	0.17	0.279	10	1.0	0
3	0.60	1900	61.5	6.26	550	28.95	0.16	0.274	10	1.0	0
4	0.84	2000	59.5	6.81	750	37.50	0.16	0.264	10	1.0	0
5	1.04	2820	68.5	4.60	565	20.04	0.23	0.377	14	0.4	0.6
15	0.87	3780	68.5	4.60	650	17.20	0.31	0.514	19	0.4	0.6
7	0.95	2500	69.6	4.37	550	22.00	0.19	0.317	11	0.4	0.6
8	1.21	3000	80.2	2.47	350	11.67	0.22	0.371	13	0.1	0.9
9	2.0	5000	68.1	4.68	800	16.00	0.40	0.674	24	0.5	0.5
10	0.42	2000	81.9	2.21	275	13.75	0.14	0.234	8	0.2	0.8
11	3.93	8000	64.8	5.43	1000	12.50	0.73	1.210	44	0.5	0.5
12	1.7	5500	76.8	3.02	400	7.27	0.51	0.846	30	0.2	0.8
13	3.1	13000	65.2	5.34	500	3.85	1.91	3.185	115	0.3	0.7
14	2.05	13000	65.2	5.34	1650	12.69	1.05	1.753	63	0.6	0.4
6	1.50	8000	76.8	3.02	500	6.25	0.74	1.232	44	0.2	0.8
Total	**22.35**										

* ΔH (ft) is the average elevation drop from the ridge top to the creek bed or reservoir edge

Notes: ** S is a dimensionless number based on the CN, calculated as 1000/CN-10

Crystal Spring Reservoir Details

Subbasin # 16: Crystal Springs Reservoir area
Reservoir area at elevation 287.8' = 2.17 sq. miles (1390 acres)
New Spillway (Ogee): Elevation = 291.8'; crest length = 206'
Release: Up to 600 cfs maximum

Additional Hydrology

Storm Type: 24-hr Type I, 30-minute intervals
Return Periods: 2-yr, 5-yr, 10-yr, 25-yr, 50-yr and 100-yr
Initial Loss: 0.2" - 0.4" (optimimm antecedent conditions)
Continuous Loss: 0.05"/hour

3.2 Reservoir Data

Reservoir data used in the model includes:

1. The LCSD stage/storage relationship
2. Initial water level elevation set at 287.8'
3. Spillway crest length at 206 feet
4. Spillway crest elevation at 291.8'

3.3 Precipitation

Two rain gages in the vicinity of the reservoir have long enough records for establishing the required rainfall statistical information. The Pilarcitos rain gage to the west of the Crystal Springs Reservoir watershed and the rain gage at the Upper Crystal Springs Reservoir, the latter within the watershed under study. While the Pilarcitos gage falls outside of the study area, it was used for some subwatersheds on the western side of the reservoir at higher elevations where higher rainfall is expected.

The rainfall data used covers a period of 100 years, 1908 to 2007, for Upper Crystal Springs Reservoir and 98 years, 1910 to 2007, for Pilarcitos. The rainfall data is in the form of 24-hour totals. For each year, the maximum 24-hour rainfall was extracted, tabulated and ranked from highest to lowest for each of the two rain gages. The Gumbel distribution was then fitted to the data to develop 24-hour rainfall values for return periods 2, 5, 10, 25, 50 and 100 years using the procedure outlined in the "Guide to Hydrometeorological Practices, WMO-No.168.TP.82, 1970".

The 24-hour rainfall in the Bay Area fits the Type I storm pattern. For each of the six return periods the 24-hour rainfall values were used to develop a synthetic hyetograph of 30-minute rainfall for each rain gage using the dimensionless Type I hyetograph. The 30-minute rainfall data for each rain gage was input to the HEC-HMS model. Some of the sub-watersheds are influenced by both rain gages hence rain gage weights were assigned to each sub-watershed to be used by the model as multipliers in the calculation of a more representative rainfall input. These rain gage weights are given in the last two columns of Table 1. The calculation or control time interval given the model is 2 minutes. Rainfall details are presented in Attachment A.

4 Model Runs

Two groups of analyses were performed, referred to as Scenario 1 and Scenario 2 and summarized in Table 2. Scenario 1 included a release to San Mateo Creek of 400 cfs for the first six hours then 600 cfs for the remainder of the simulation period. Scenario 2 assumed no release from the reservoir to San Mateo Creek. The simulation period in each model run was six days. Each scenario has six simulation runs, one for each of the six rainfall return periods (2, 5, 10, 25, 50 and 100 years). Evaporation and seepage losses, if any, have been ignored.

Table 2 – Model Scenarios

Operational Scenario	Simulation Period	Release from LCSD to San Mateo Creek	Reservoir Level at Start of Simulation	Transfers into CSR at Polhemus	Transfers from CSR to San Andreas Reservoir
Scenario 1	6 days	400cfs for first 6hrs, 600cfs for remainder	287.8'	No Transfers	No Transfers
Scenario 2	6 days	No Release	287.8'	No Transfers	No Transfers

5 MODEL RESULTS

The results for Scenario 1 and Scenario 2 are presented in the form of a matrix which shows the number of hours that the reservoir level exceeds a series of water level elevations for the six rainfall return periods. Table 3 lists the results for Scenario 1, which assumes a six-hour release at 400 cfs in the beginning of the simulation, followed by a release of 600 cfs for the remainder of the simulation period. Table 4 lists the results for Scenario 2, which assumes no release throughout the six-day simulation period.

Note that for Scenario 1 and the operational conditions discussed above, no overflow is expected for all storms analyzed, including the 100-year design storm. In Scenario 2 the various reservoir levels are submerged for longer periods than corresponding levels in Scenario 1. Under Scenario 2, the 50-yr and 100-yr storms water levels are expected to rise above the proposed spillway level, resulting in uncontrolled spill to San Mateo Creek.

Hydrographs, reservoir levels and volumes for the five storms in each of the two scenarios are presented in Attachment B.

Table 3 – Scenario 1 Results Expressed as Duration of Inundation at Various Elevations

Scenario 1 Release of 400 cfs for first 6 hours at beginning of storm, then 600 cfs

	Time duration that elevation is equalled or exceeded (hrs) for designated return period storm					
Reservoir W.L. Elavation	**2-yr**	**5-yr**	**10-yr**	**25-yr**	**50-yr**	**100-yr**
291.8*	0	0	0	0	0	0
291.5	0	0	0	0	0	13.0
291.0	0	0	0	0	11.8	33.7
290.5	0	0	0	10.5	32.7	50.6
290.0	0	0	0	31.5	49.4	66.1
289.5	0	0	24.8	48.4	65.1	81.3
289.0	0	23.5	41.9	63.9	80.3	96.4
288.5	13.5	39.9	57.2	78.9	95.1	111.1
288.0	30.2	55.4	72.8	95.1	112.0	128.4
287.8**	39.7	67.0	87.5	108.8	124.7	140.5
Peak Elevation	288.6	289.3	289.9	290.6	291.1	291.6
Peak Overlow (cfs)	0	0	0	0	0	0

* Spillway crest elevation
** Operational water level elevation

Note: For low return periods reservoir level will drop below the operational level if release continues

Table 4 – Scenario 2 Results Expressed as Duration of Inundation at Various Elevations

Scenario 2 **No release allowed during entire 6-day simulation period**

	Time duration that elevation is equalled or exceeded (hrs) for designated return period storm					
Reservoir W.L. Elevation	**2-year Storm**	**5-year Storm**	**10-year Storm**	**25-year Storm**	**50-year Storm**	**100-year Storm**
291.8*	0.0	0.0	0.0	0.0	122.1	127.4
291.5	0.0	0.0	0.0	98.2	126.1	129.3
291.0	0.0	0.0	0.0	126.5	129.8	131.3
290.5	0.0	0.0	124.5	130.4	131.8	132.5
290.0	0.0	124.1	130.4	132.3	132.9	133.2
289.5	0.0	131.1	132.5	133.2	133.5	133.7
289.0	130.8	133.0	133.5	133.8	133.9	134.1
288.5	133.3	133.9	134.1	134.4	134.8	135.2
288.0	134.9	136.3	137.2	138.1	138.7	139.1
287.8**	144.0	144.0	144.0	144.0	144.0	144.0
Peak Elevation	289.3	290.2	290.8	291.5	292.0	292.4
Peak Overlow (cfs)	0	0	0	0	44	294

* Spillway crest elevation

** Operational water level elevation

ATTACHMENTS

ATTACHMENT A	Rainfall Analysis
ATTACHMENT B	HEC-HMS Model Output

TABLE A-1.1 DEVELOPING DESIGN STORMS USING THE GUMBEL DISTRIBUTION

PILARCITOS RAINGAGE

RANK	24-hr Annual Max* X	Return Period $T_r = (n+1)/m$	$X-X_{ave}$	$(X-X_{ave})^2$	X^2
1	6.50	99.00	3.26	10.62	42.25
2	6.25	49.50	3.01	9.05	39.06
3	6.14	33.00	2.90	8.40	37.70
4	5.90	24.75	2.66	7.07	34.81
5	5.86	19.80	2.62	6.86	34.34
6	5.42	16.50	2.18	4.75	29.38
7	5.11	14.14	1.87	3.49	26.11
8	4.93	12.38	1.69	2.85	24.30
9	4.80	11.00	1.56	2.43	23.04
10	4.78	9.90	1.54	2.37	22.85
11	4.75	9.00	1.51	2.28	22.56
12	4.68	8.25	1.44	2.07	21.90
13	4.50	7.62	1.26	1.58	20.25
14	4.46	7.07	1.22	1.48	19.89
15	4.42	6.60	1.18	1.39	19.54
16	4.41	6.19	1.17	1.37	19.45
17	4.40	5.82	1.16	1.34	19.36
18	4.18	5.50	0.94	0.88	17.47
19	4.16	5.21	0.92	0.84	17.31
20	4.11	4.95	0.87	0.75	16.89
21	4.07	4.71	0.83	0.69	16.56
22	4.02	4.50	0.78	0.61	16.16
23	4.00	4.30	0.76	0.58	16.00
24	3.96	4.13	0.72	0.52	15.68
25	3.95	3.96	0.71	0.50	15.60
26	3.93	3.81	0.69	0.47	15.44
27	3.90	3.67	0.66	0.43	15.21
28	3.81	3.54	0.57	0.32	14.52
29	3.75	3.41	0.51	0.26	14.06
30	3.75	3.30	0.51	0.26	14.06
31	3.73	3.19	0.49	0.24	13.91
32	3.66	3.09	0.42	0.18	13.40
33	3.65	3.00	0.41	0.17	13.32
34	3.56	2.91	0.32	0.10	12.67
35	3.55	2.83	0.31	0.10	12.60
36	3.50	2.75	0.26	0.07	12.25
37	3.50	2.68	0.26	0.07	12.25
38	3.50	2.61	0.26	0.07	12.25
39	3.40	2.54	0.16	0.03	11.56
40	3.40	2.48	0.16	0.03	11.56
41	3.36	2.41	0.12	0.01	11.29
42	3.32	2.36	0.08	0.01	11.02
43	3.25	2.30	0.01	0.00	10.56
44	3.21	2.25	-0.03	0.00	10.30
45	3.20	2.20	-0.04	0.00	10.24
46	3.18	2.15	-0.06	0.00	10.11
47	3.18	2.11	-0.06	0.00	10.11
48	3.16	2.06	-0.08	0.01	9.99
49	3.15	2.02	-0.09	0.01	9.92
50	3.14	1.98	-0.10	0.01	9.86
51	3.04	1.94	-0.20	0.04	9.24
52	3.03	1.90	-0.21	0.04	9.18
53	2.92	1.87	-0.32	0.10	8.53
54	2.76	1.83	-0.48	0.23	7.62

RANK	24-hr Annual Max* X	Return Period $T_r = (n+1)/m$	$X-X_{ave}$	$(X-X_{ave})^2$	X^2
55	2.75	1.80	-0.49	0.24	7.56
56	2.74	1.77	-0.50	0.25	7.51
57	2.73	1.74	-0.51	0.26	7.45
58	2.73	1.71	-0.51	0.26	7.45
59	2.72	1.68	-0.52	0.27	7.40
60	2.70	1.65	-0.54	0.29	7.29
61	2.65	1.62	-0.59	0.35	7.02
62	2.60	1.60	-0.64	0.41	6.76
63	2.58	1.57	-0.66	0.44	6.66
64	2.57	1.55	-0.67	0.45	6.60
65	2.50	1.52	-0.74	0.55	6.25
66	2.48	1.50	-0.76	0.58	6.15
67	2.48	1.48	-0.76	0.58	6.15
68	2.47	1.46	-0.77	0.60	6.10
69	2.46	1.43	-0.78	0.61	6.05
70	2.43	1.41	-0.81	0.66	5.90
71	2.42	1.39	-0.82	0.67	5.86
72	2.38	1.38	-0.86	0.74	5.66
73	2.38	1.36	-0.86	0.74	5.66
74	2.37	1.34	-0.87	0.76	5.62
75	2.31	1.32	-0.93	0.87	5.34
76	2.30	1.30	-0.94	0.89	5.29
77	2.30	1.29	-0.94	0.89	5.29
78	2.29	1.27	-0.95	0.91	5.24
79	2.28	1.25	-0.96	0.92	5.20
80	2.25	1.24	-0.99	0.98	5.06
81	2.22	1.22	-1.02	1.04	4.93
82	2.22	1.21	-1.02	1.04	4.93
83	2.18	1.19	-1.06	1.13	4.75
84	2.15	1.18	-1.09	1.19	4.62
85	2.14	1.16	-1.10	1.21	4.58
86	2.11	1.15	-1.13	1.28	4.45
87	2.02	1.14	-1.22	1.49	4.08
88	2.00	1.13	-1.24	1.54	4.00
89	1.95	1.11	-1.29	1.67	3.80
90	1.93	1.10	-1.31	1.72	3.72
91	1.84	1.09	-1.40	1.96	3.39
92	1.83	1.08	-1.41	1.99	3.35
93	1.82	1.06	-1.42	2.02	3.31
94	1.80	1.05	-1.44	2.08	3.24
95	1.71	1.04	-1.53	2.35	2.92
96	1.68	1.03	-1.56	2.44	2.82
97	1.60	1.02	-1.64	2.69	2.56
98	1.35	1.01	-1.89	3.58	1.82
	317.67			125.61	1155.35
Ave X	3.242 inches				

* The annual hourly maximum rainfall came from records for the two raingages

Attachment A: Statistical Analysis of Rainfall Data from Pilarcitos and Upper Crystal Springs Rain Gages

PILARCITOS RAINGAGE

$S_x =$ 1.1380
$S_n =$ 1.2055
$Y_n =$ 0.5598

$X_2 =$ 3.06
$X_5 =$ 4.13
$X_{10} =$ 4.84
$X_{25} =$ 5.73
$X_{50} =$ 6.40
$X_{100} =$ 7.06

Return Period R_p	24hr Rainfall (in)
2	3.06
5	4.13
10	4.84
25	5.73
50	6.40
100	7.06

Referecne: Guide to Hydrometeorological Practices, WMO-No.168.TP.82, 1970

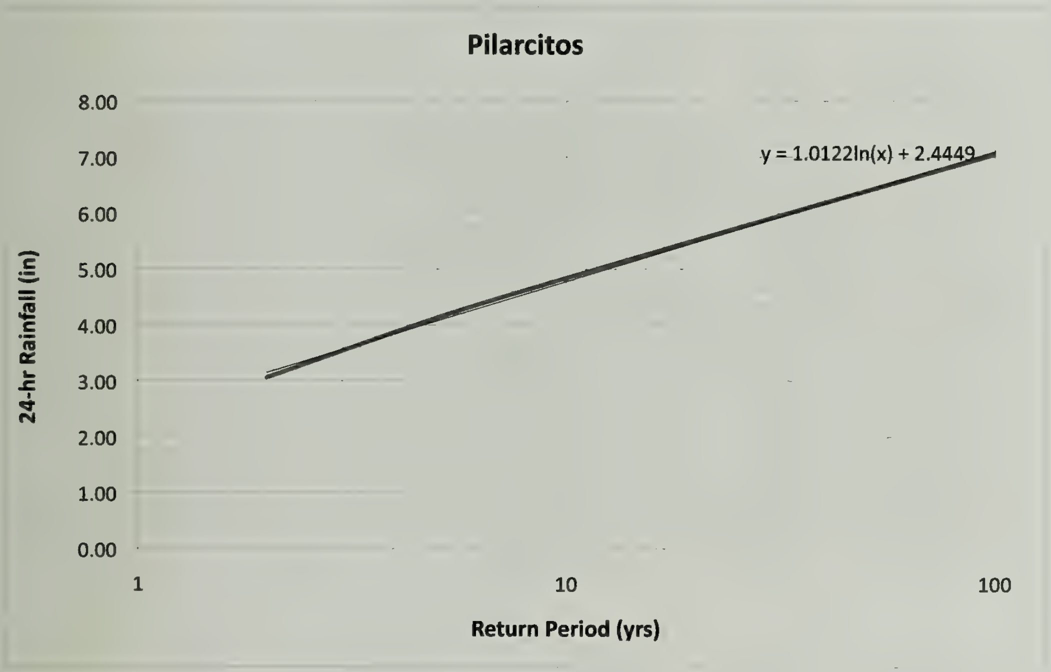


TABLE A-1.2 DEVELOPING DESIGN STORMS USING THE GUMBEL DISTRIBUTION

UPPER CRYSTAL SPRINGS RAINGAGE

RANK	24-hr Annual Max* X	Return Period $T_r = (n+1)/m$	$X-X_{ave}$	$(X-X_{ave})^2$	X^2
1	5.50	101.00	3.21	10.32	30.25
2	5.18	50.50	2.89	8.36	26.83
3	4.80	33.67	2.51	6.31	23.04
4	4.32	25.25	2.03	4.13	18.66
5	4.02	20.20	1.73	3.00	16.16
6	3.72	16.83	1.43	2.05	13.84
7	3.65	14.43	1.36	1.85	13.32
8	3.63	12.63	1.34	1.80	13.18
9	3.53	11.22	1.24	1.54	12.46
10	3.50	10.10	1.21	1.47	12.25
11	3.28	9.18	0.99	0.98	10.76
12	3.20	8.42	0.91	0.83	10.24
13	3.13	7.77	0.84	0.71	9.80
14	3.10	7.21	0.81	0.66	9.61
15	3.10	6.73	0.81	0.66	9.61
16	3.07	6.31	0.78	0.61	9.42
17	3.01	5.94	0.72	0.52	9.06
18	2.98	5.61	0.69	0.48	8.88
19	2.97	5.32	0.68	0.46	8.82
20	2.94	5.05	0.65	0.42	8.64
21	2.89	4.81	0.60	0.36	8.35
22	2.86	4.59	0.57	0.33	8.18
23	2.83	4.39	0.54	0.29	8.01
24	2.83	4.21	0.54	0.29	8.01
25	2.74	4.04	0.45	0.20	7.51
26	2.70	3.88	0.41	0.17	7.29
27	2.65	3.74	0.36	0.13	7.02
28	2.65	3.61	0.36	0.13	7.02
29	2.60	3.48	0.31	0.10	6.76
30	2.57	3.37	0.28	0.08	6.60
31	2.53	3.26	0.24	0.06	6.40
32	2.52	3.16	0.23	0.05	6.35
33	2.50	3.06	0.21	0.04	6.25
34	2.50	2.97	0.21	0.04	6.25
35	2.42	2.89	0.13	0.02	5.86
36	2.40	2.81	0.11	0.01	5.76
37	2.30	2.73	0.01	0.00	5.29
38	2.26	2.66	-0.03	0.00	5.11
39	2.24	2.59	-0.05	0.00	5.02
40	2.23	2.53	-0.06	0.00	4.97
41	2.23	2.46	-0.06	0.00	4.97
42	2.16	2.40	-0.13	0.02	4.67
43	2.15	2.35	-0.14	0.02	4.62
44	2.15	2.30	-0.14	0.02	4.62
45	2.15	2.24	-0.14	0.02	4.62
46	2.14	2.20	-0.15	0.02	4.58
47	2.13	2.15	-0.16	0.03	4.54
48	2.11	2.10	-0.18	0.03	4.45
49	2.10	2.06	-0.19	0.04	4.41
50	2.09	2.02	-0.20	0.04	4.37
51	2.08	1.98	-0.21	0.04	4.33
52	2.07	1.94	-0.22	0.05	4.28
53	2.07	1.91	-0.22	0.05	4.28
54	2.05	1.87	-0.24	0.06	4.20
55	2.04	1.84	-0.25	0.06	4.16
56	2.00	1.80	-0.29	0.08	4.00

RANK	24-hr Annual Max* X	Return Period $T_r = (n+1)/m$	$X-X_{ave}$	$(X-X_{ave})^2$	X^2
57	2.00	1.77	-0.29	0.08	4.00
58	2.00	1.74	-0.29	0.08	4.00
59	1.99	1.71	-0.30	0.09	3.96
60	1.95	1.68	-0.34	0.11	3.80
61	1.92	1.66	-0.37	0.14	3.69
62	1.92	1.63	-0.37	0.14	3.69
63	1.87	1.60	-0.42	0.17	3.50
64	1.86	1.58	-0.43	0.18	3.46
65	1.86	1.55	-0.43	0.18	3.46
66	1.85	1.53	-0.44	0.19	3.42
67	1.85	1.51	-0.44	0.19	3.42
68	1.83	1.49	-0.46	0.21	3.35
69	1.83	1.46	-0.46	0.21	3.35
70	1.82	1.44	-0.47	0.22	3.31
71	1.79	1.42	-0.50	0.25	3.20
72	1.77	1.40	-0.52	0.27	3.13
73	1.76	1.38	-0.53	0.28	3.10
74	1.72	1.36	-0.57	0.32	2.96
75	1.70	1.35	-0.59	0.35	2.89
76	1.63	1.33	-0.66	0.43	2.66
77	1.61	1.31	-0.68	0.46	2.59
78	1.60	1.29	-0.69	0.47	2.56
79	1.60	1.28	-0.69	0.47	2.56
80	1.58	1.26	-0.71	0.50	2.50
81	1.57	1.25	-0.72	0.52	2.46
82	1.57	1.23	-0.72	0.52	2.46
83	1.57	1.22	-0.72	0.52	2.46
84	1.56	1.20	-0.73	0.53	2.43
85	1.53	1.19	-0.76	0.57	2.34
86	1.51	1.17	-0.78	0.61	2.28
87	1.50	1.16	-0.79	0.62	2.25
88	1.44	1.15	-0.85	0.72	2.07
89	1.44	1.13	-0.85	0.72	2.07
90	1.40	1.12	-0.89	0.79	1.96
91	1.40	1.11	-0.89	0.79	1.96
92	1.40	1.10	-0.89	0.79	1.96
93	1.39	1.09	-0.90	0.81	1.93
94	1.35	1.07	-0.94	0.88	1.82
95	1.35	1.06	-0.94	0.88	1.82
96	1.35	1.05	-0.94	0.88	1.82
97	1.29	1.04	-1.00	1.00	1.66
98	1.15	1.03	-1.14	1.30	1.32
99	1.12	1.02	-1.17	1.36	1.25
100	1.05	1.01	-1.24	1.53	1.10
	228.82			72.40	595.99
Ave X	2.288 inches				

* The annual hourly maximum rainfall came from records for the two raingages

UPPER CRYSTAL SPRINGS RAINGAGE

S_x = 0.8552
S_n = 1.2065
Y_n = 0.56

X_2 = 2.15
X_5 = 2.95
X_{10} = 3.49
X_{25} = 4.16
X_{50} = 4.66
X_{100} = 5.15

Return Period R_p	24hr Rainfall (in)
2	2.15
5	2.95
10	3.49
25	4.16
50	4.66
100	5.15

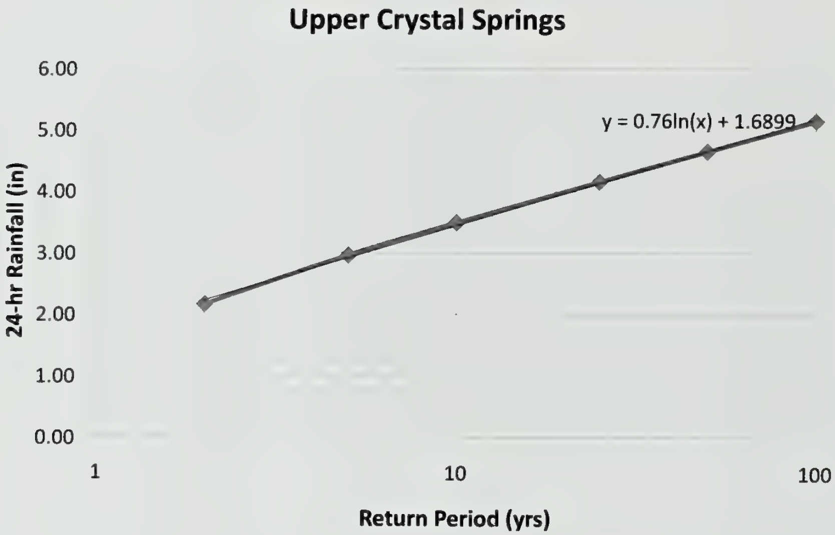


TABLE A - 2
Pilarcitos Raingage : 30-minute Rainfall input to HEC-HMS

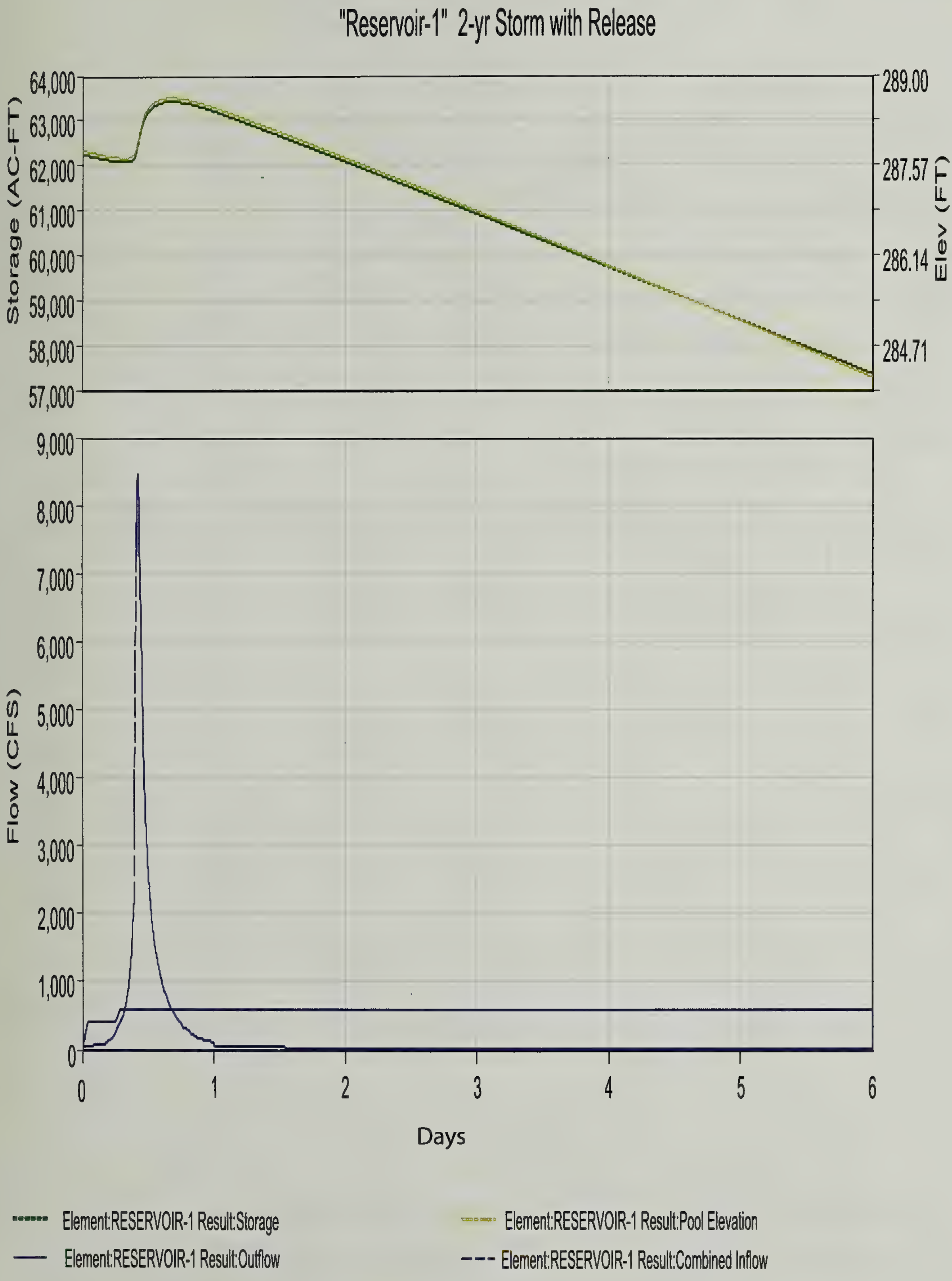
Half-Hour Intervals	Cum. Rainfall fraction per 30 min.	Dimensionless hyetograph Type I Storm	24-hr Rainfall for indicated return periods					
			100-yr	50-yr	25-yr	10-yr	5-yr	2-yr
			7.06 in.	6.4 in.	5.73 in.	4.84 in.	4.13 in.	3.06 in.
0	0	0	0	0	0	0	0	0
1	0.008	0.0080	0.0565	0.0512	0.0458	0.0387	0.0330	0.0245
2	0.017	0.0090	0.0635	0.0576	0.0516	0.0436	0.0372	0.0275
3	0.026	0.0090	0.0635	0.0576	0.0516	0.0436	0.0372	0.0275
4	0.035	0.0090	0.0635	0.0576	0.0516	0.0436	0.0372	0.0275
5	0.045	0.0100	0.0706	0.0640	0.0573	0.0484	0.0413	0.0306
6	0.055	0.0100	0.0706	0.0640	0.0573	0.0484	0.0413	0.0306
7	0.065	0.0100	0.0706	0.0640	0.0573	0.0484	0.0413	0.0306
8	0.076	0.0110	0.0777	0.0704	0.0630	0.0532	0.0454	0.0337
9	0.087	0.0110	0.0777	0.0704	0.0630	0.0532	0.0454	0.0337
10	0.099	0.0120	0.0847	0.0768	0.0688	0.0581	0.0496	0.0367
11	0.111	0.0120	0.0847	0.0768	0.0688	0.0581	0.0496	0.0367
12	0.125	0.0140	0.0988	0.0896	0.0802	0.0678	0.0578	0.0428
13	0.14	0.0150	0.1059	0.0960	0.0860	0.0726	0.0620	0.0459
14	0.156	0.0160	0.1130	0.1024	0.0917	0.0774	0.0661	0.0490
15	0.174	0.0180	0.1271	0.1152	0.1031	0.0871	0.0743	0.0551
16	0.194	0.0200	0.1412	0.1280	0.1146	0.0968	0.0826	0.0612
17	0.219	0.0250	0.1765	0.1600	0.1433	0.1210	0.1033	0.0765
18	0.254	0.0350	0.2471	0.2240	0.2006	0.1694	0.1446	0.1071
19	0.303	0.0490	0.3459	0.3136	0.2808	0.2372	0.2024	0.1499
20	0.515	0.2120	1.4967	1.3568	1.2148	1.0261	0.8756	0.6487
21	0.583	0.0680	0.4801	0.4352	0.3896	0.3291	0.2808	0.2081
22	0.624	0.0410	0.2895	0.2624	0.2349	0.1984	0.1693	0.1255
23	0.654	0.0300	0.2118	0.1920	0.1719	0.1452	0.1239	0.0918
24	0.682	0.0280	0.1977	0.1792	0.1604	0.1355	0.1156	0.0857
25	0.705	0.0230	0.1624	0.1472	0.1318	0.1113	0.0950	0.0704
26	0.727	0.0220	0.1553	0.1408	0.1261	0.1065	0.0909	0.0673
27	0.748	0.0210	0.1483	0.1344	0.1203	0.1016	0.0867	0.0643
28	0.767	0.0190	0.1341	0.1216	0.1089	0.0920	0.0785	0.0581
29	0.784	0.0170	0.1200	0.1088	0.0974	0.0823	0.0702	0.0520
30	0.8	0.0160	0.1130	0.1024	0.0917	0.0774	0.0661	0.0490
31	0.816	0.0160	0.1130	0.1024	0.0917	0.0774	0.0661	0.0490
32	0.83	0.0140	0.0988	0.0896	0.0802	0.0678	0.0578	0.0428
33	0.844	0.0140	0.0988	0.0896	0.0802	0.0678	0.0578	0.0428
34	0.857	0.0130	0.0918	0.0832	0.0745	0.0629	0.0537	0.0398
35	0.87	0.0130	0.0918	0.0832	0.0745	0.0629	0.0537	0.0398
36	0.882	0.0120	0.0847	0.0768	0.0688	0.0581	0.0496	0.0367
37	0.893	0.0110	0.0777	0.0704	0.0630	0.0532	0.0454	0.0337
38	0.905	0.0120	0.0847	0.0768	0.0688	0.0581	0.0496	0.0367
39	0.916	0.0110	0.0777	0.0704	0.0630	0.0532	0.0454	0.0337
40	0.926	0.0100	0.0706	0.0640	0.0573	0.0484	0.0413	0.0306
41	0.936	0.0100	0.0706	0.0640	0.0573	0.0484	0.0413	0.0306
42	0.946	0.0100	0.0706	0.0640	0.0573	0.0484	0.0413	0.0306
43	0.955	0.0090	0.0635	0.0576	0.0516	0.0436	0.0372	0.0275
44	0.965	0.0100	0.0706	0.0640	0.0573	0.0484	0.0413	0.0306
45	0.974	0.0090	0.0635	0.0576	0.0516	0.0436	0.0372	0.0275
46	0.983	0.0090	0.0635	0.0576	0.0516	0.0436	0.0372	0.0275
47	0.992	0.0090	0.0635	0.0576	0.0516	0.0436	0.0372	0.0275
48	1	0.0080	0.0565	0.0512	0.0458	0.0387	0.0330	0.0245
		1.0000	7.0600	6.4000	5.7300	4.8400	4.1300	3.0600

TABLE A - 3

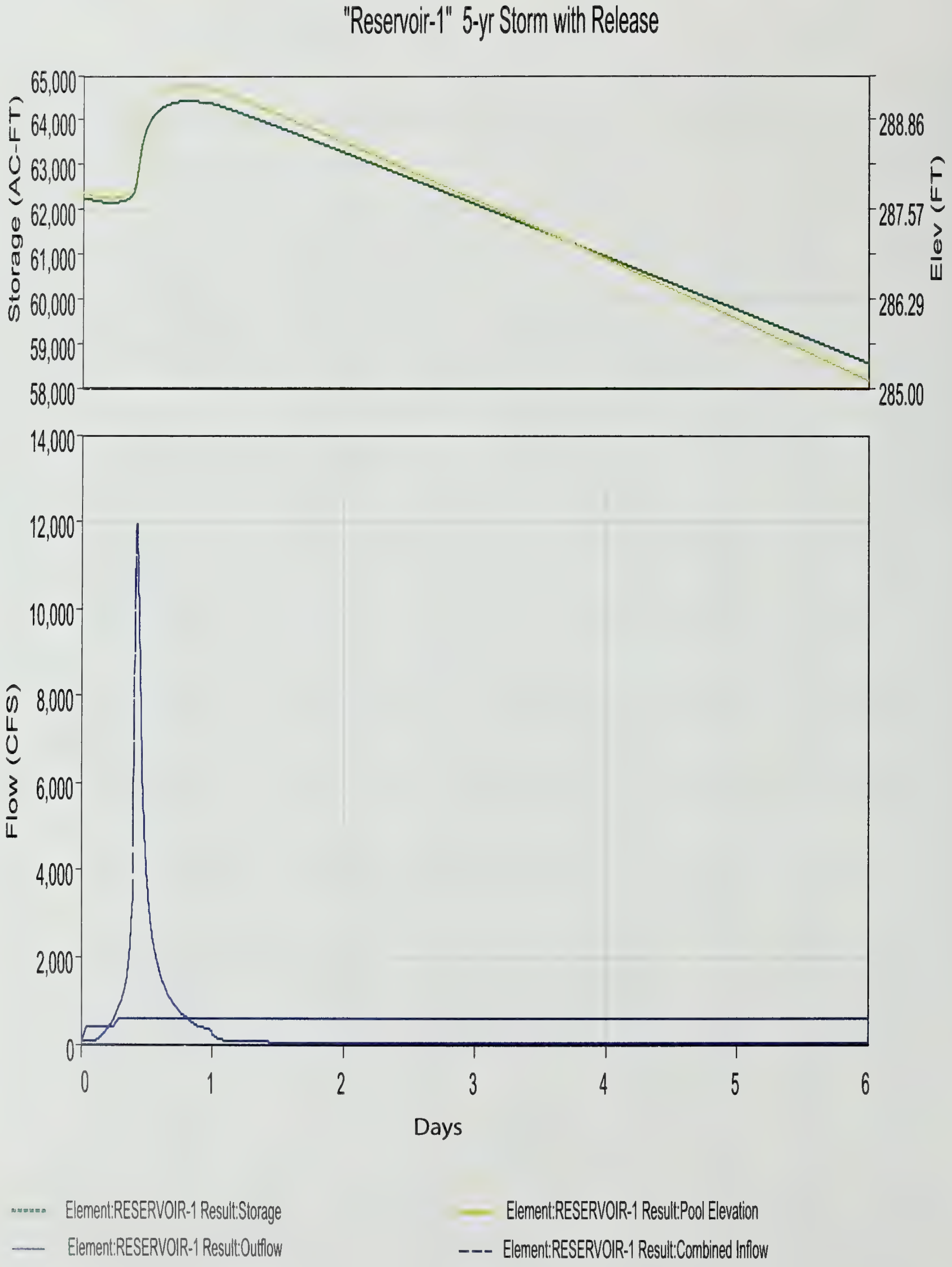
Upper CS Reservoir Raingage : 30-minute Rainfall input to HEC-HMS

Half-Hour Intervals	Rainfall fraction per 30 min.	Dimensionless hyetograph Type I Storm	24-hr Rainfall for indicated return periods					
			100-yr 5.15 in.	50-yr 4.66 in.	25-yr 4.16 in.	10-yr 3.49 in.	5-yr 2.95 in.	2-yr 2.15 in.
0	0	0	0	0	0	0	0	0
1	0.008	0.0080	0.0412	0.0373	0.0333	0.0279	0.0236	0.0172
2	0.017	0.0090	0.0464	0.0419	0.0374	0.0314	0.0266	0.0194
3	0.026	0.0090	0.0464	0.0419	0.0374	0.0314	0.0266	0.0194
4	0.035	0.0090	0.0464	0.0419	0.0374	0.0314	0.0266	0.0194
5	0.045	0.0100	0.0515	0.0466	0.0416	0.0349	0.0295	0.0215
6	0.055	0.0100	0.0515	0.0466	0.0416	0.0349	0.0295	0.0215
7	0.065	0.0100	0.0515	0.0466	0.0416	0.0349	0.0295	0.0215
8	0.076	0.0110	0.0567	0.0513	0.0458	0.0384	0.0325	0.0237
9	0.087	0.0110	0.0567	0.0513	0.0458	0.0384	0.0325	0.0237
10	0.099	0.0120	0.0618	0.0559	0.0499	0.0419	0.0354	0.0258
11	0.111	0.0120	0.0618	0.0559	0.0499	0.0419	0.0354	0.0258
12	0.125	0.0140	0.0721	0.0652	0.0582	0.0489	0.0413	0.0301
13	0.14	0.0150	0.0773	0.0699	0.0624	0.0524	0.0443	0.0323
14	0.156	0.0160	0.0824	0.0746	0.0666	0.0558	0.0472	0.0344
15	0.174	0.0180	0.0927	0.0839	0.0749	0.0628	0.0531	0.0387
16	0.194	0.0200	0.1030	0.0932	0.0832	0.0698	0.0590	0.0430
17	0.219	0.0250	0.1288	0.1165	0.1040	0.0873	0.0738	0.0538
18	0.254	0.0350	0.1803	0.1631	0.1456	0.1222	0.1033	0.0753
19	0.303	0.0490	0.2524	0.2283	0.2038	0.1710	0.1446	0.1054
20	0.515	0.2120	1.0918	0.9879	0.8819	0.7399	0.6254	0.4558
21	0.583	0.0680	0.3502	0.3169	0.2829	0.2373	0.2006	0.1462
22	0.624	0.0410	0.2112	0.1911	0.1706	0.1431	0.1210	0.0882
23	0.654	0.0300	0.1545	0.1398	0.1248	0.1047	0.0885	0.0645
24	0.682	0.0280	0.1442	0.1305	0.1165	0.0977	0.0826	0.0602
25	0.705	0.0230	0.1185	0.1072	0.0957	0.0803	0.0678	0.0494
26	0.727	0.0220	0.1133	0.1025	0.0915	0.0768	0.0649	0.0473
27	0.748	0.0210	0.1082	0.0979	0.0874	0.0733	0.0620	0.0452
28	0.767	0.0190	0.0979	0.0885	0.0790	0.0663	0.0561	0.0409
29	0.784	0.0170	0.0876	0.0792	0.0707	0.0593	0.0502	0.0366
30	0.8	0.0160	0.0824	0.0746	0.0666	0.0558	0.0472	0.0344
31	0.816	0.0160	0.0824	0.0746	0.0666	0.0558	0.0472	0.0344
32	0.83	0.0140	0.0721	0.0652	0.0582	0.0489	0.0413	0.0301
33	0.844	0.0140	0.0721	0.0652	0.0582	0.0489	0.0413	0.0301
34	0.857	0.0130	0.0670	0.0606	0.0541	0.0454	0.0384	0.0280
35	0.87	0.0130	0.0670	0.0606	0.0541	0.0454	0.0384	0.0280
36	0.882	0.0120	0.0618	0.0559	0.0499	0.0419	0.0354	0.0258
37	0.893	0.0110	0.0567	0.0513	0.0458	0.0384	0.0325	0.0237
38	0.905	0.0120	0.0618	0.0559	0.0499	0.0419	0.0354	0.0258
39	0.916	0.0110	0.0567	0.0513	0.0458	0.0384	0.0325	0.0237
40	0.926	0.0100	0.0515	0.0466	0.0416	0.0349	0.0295	0.0215
41	0.936	0.0100	0.0515	0.0466	0.0416	0.0349	0.0295	0.0215
42	0.946	0.0100	0.0515	0.0466	0.0416	0.0349	0.0295	0.0215
43	0.955	0.0090	0.0464	0.0419	0.0374	0.0314	0.0266	0.0194
44	0.965	0.0100	0.0515	0.0466	0.0416	0.0349	0.0295	0.0215
45	0.974	0.0090	0.0464	0.0419	0.0374	0.0314	0.0266	0.0194
46	0.983	0.0090	0.0464	0.0419	0.0374	0.0314	0.0266	0.0194
47	0.992	0.0090	0.0464	0.0419	0.0374	0.0314	0.0266	0.0194
48	1	0.0080	0.0412	0.0373	0.0333	0.0279	0.0236	0.0172
		1.0000	5.1500	4.6600	4.1600	3.4900	2.9500	2.1500

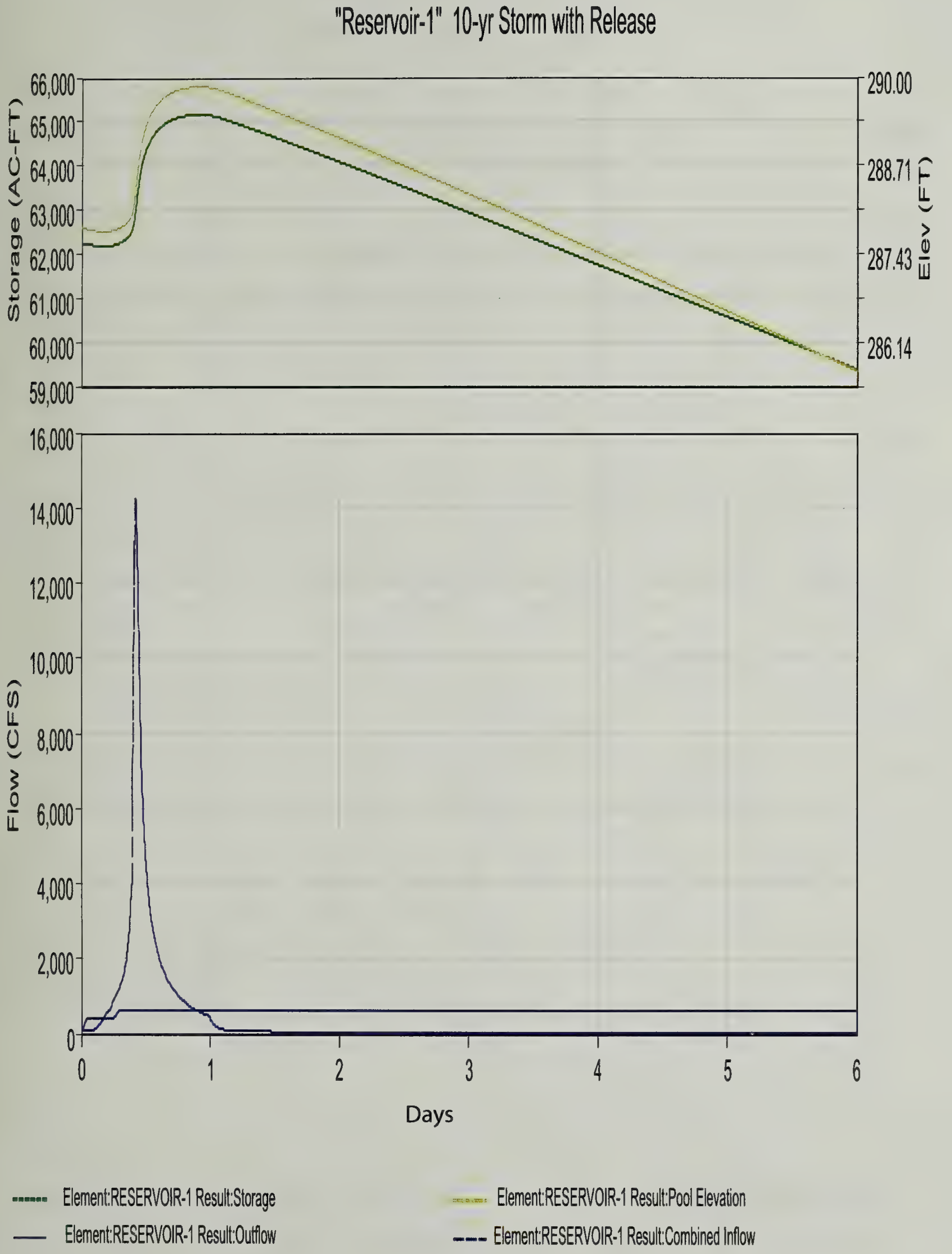
Attachment B: Scenario 1 Model Results
Release of 400 cfs for first 6 hours, then 600 cfs for Remainder of Simulation



Attachment B: Scenario 1 Model Results
Release of 400 cfs for first 6 hours, then 600 cfs for Remainder of Simulation

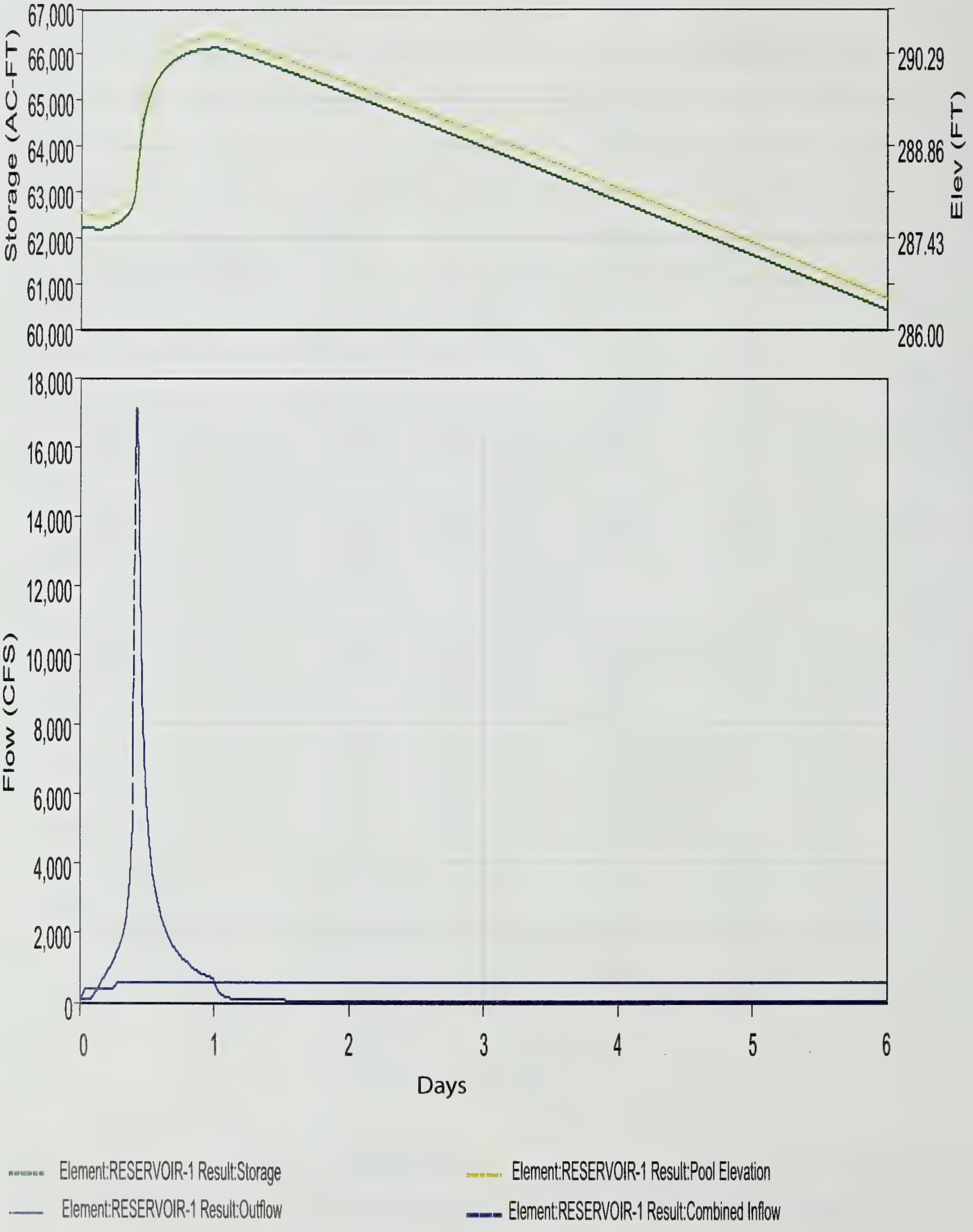


Attachment B: Scenario 1 Model Results
Release of 400 cfs for first 6 hours, then 600 cfs for Remainder of Simulation

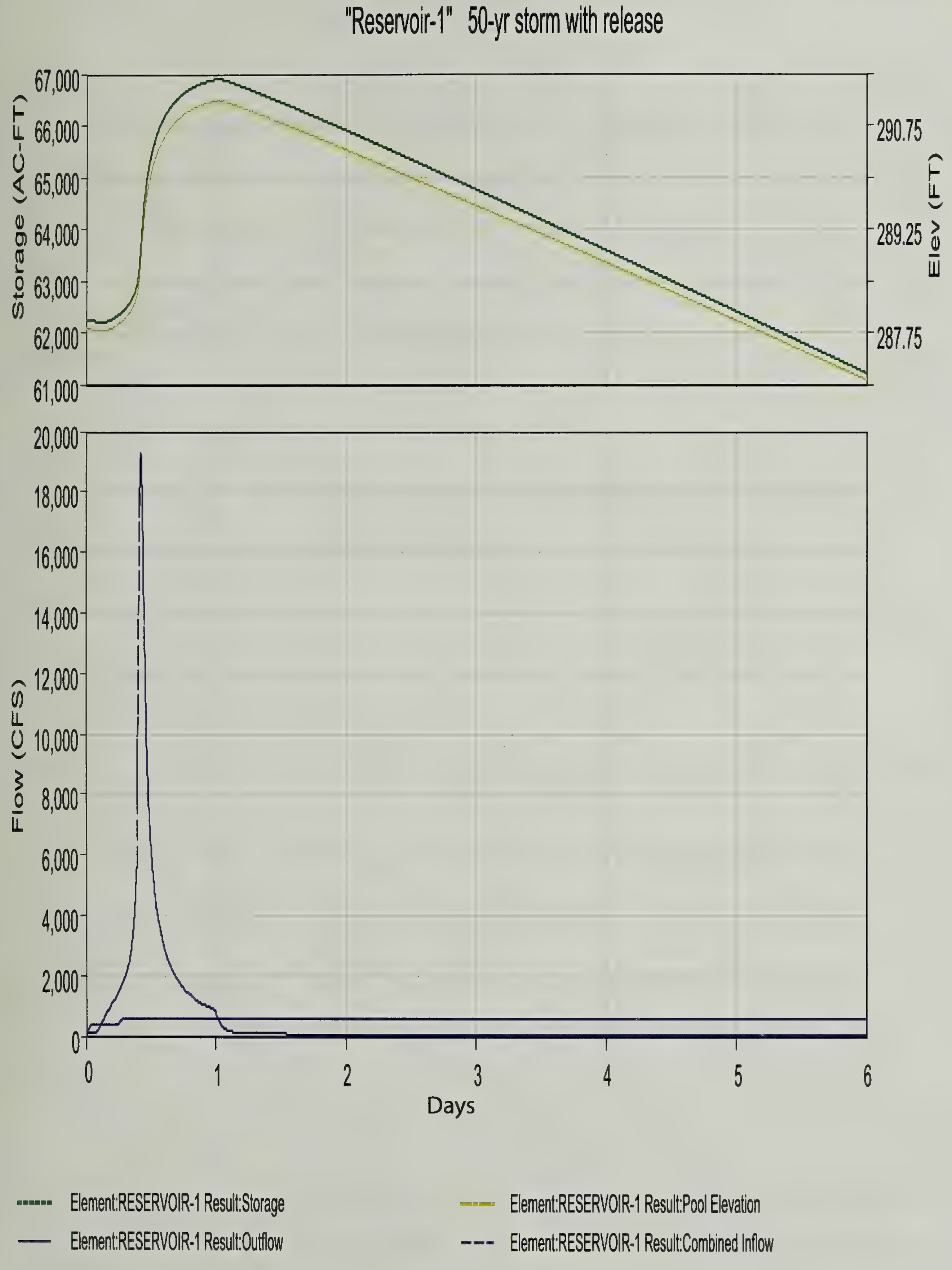


Attachment B: Scenario 1 Model Results
Release of 400 cfs for first 6 hours, then 600 cfs for Remainder of Simulation

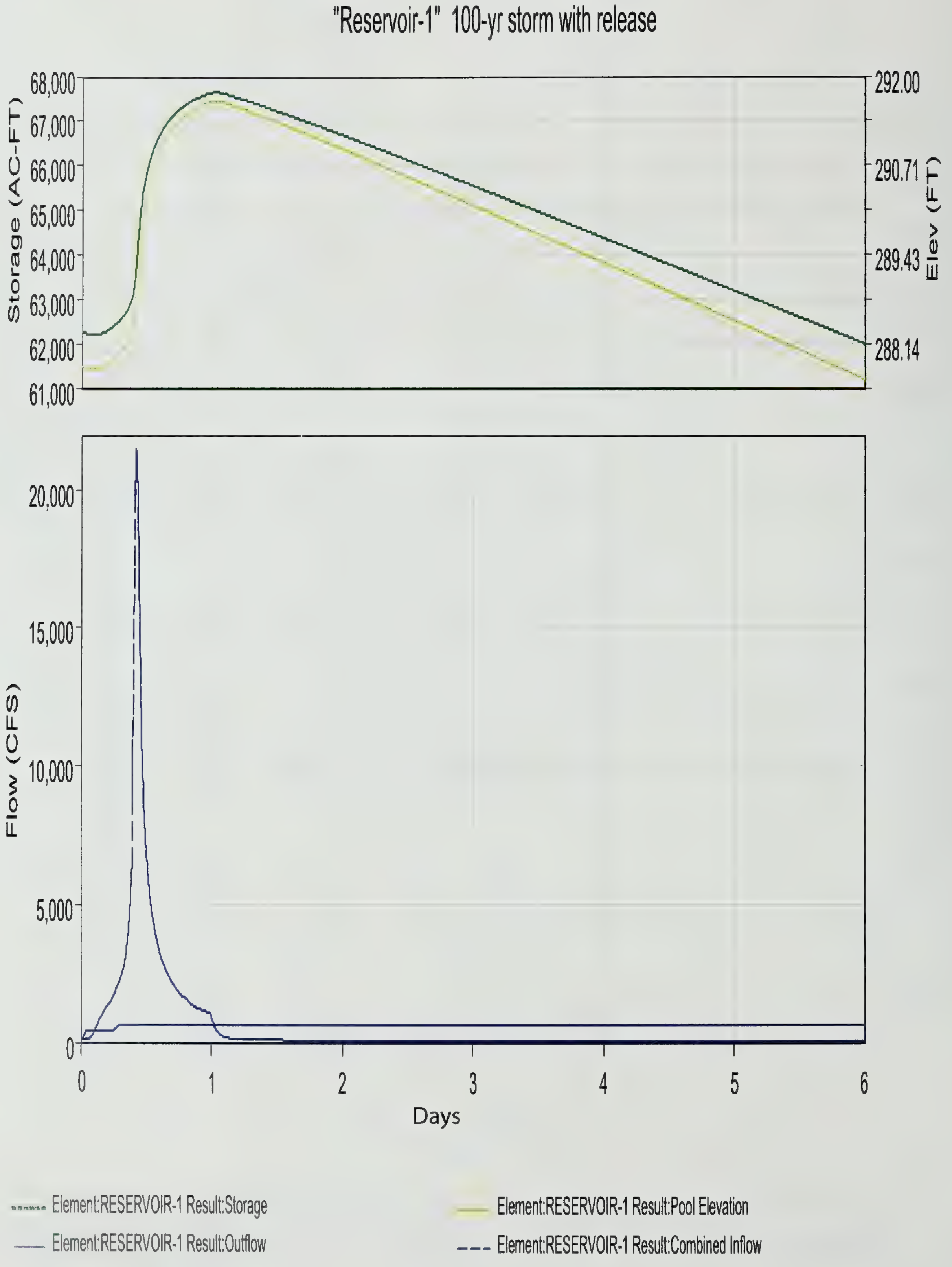
"Reservoir-1" 25-yr Storm with Release

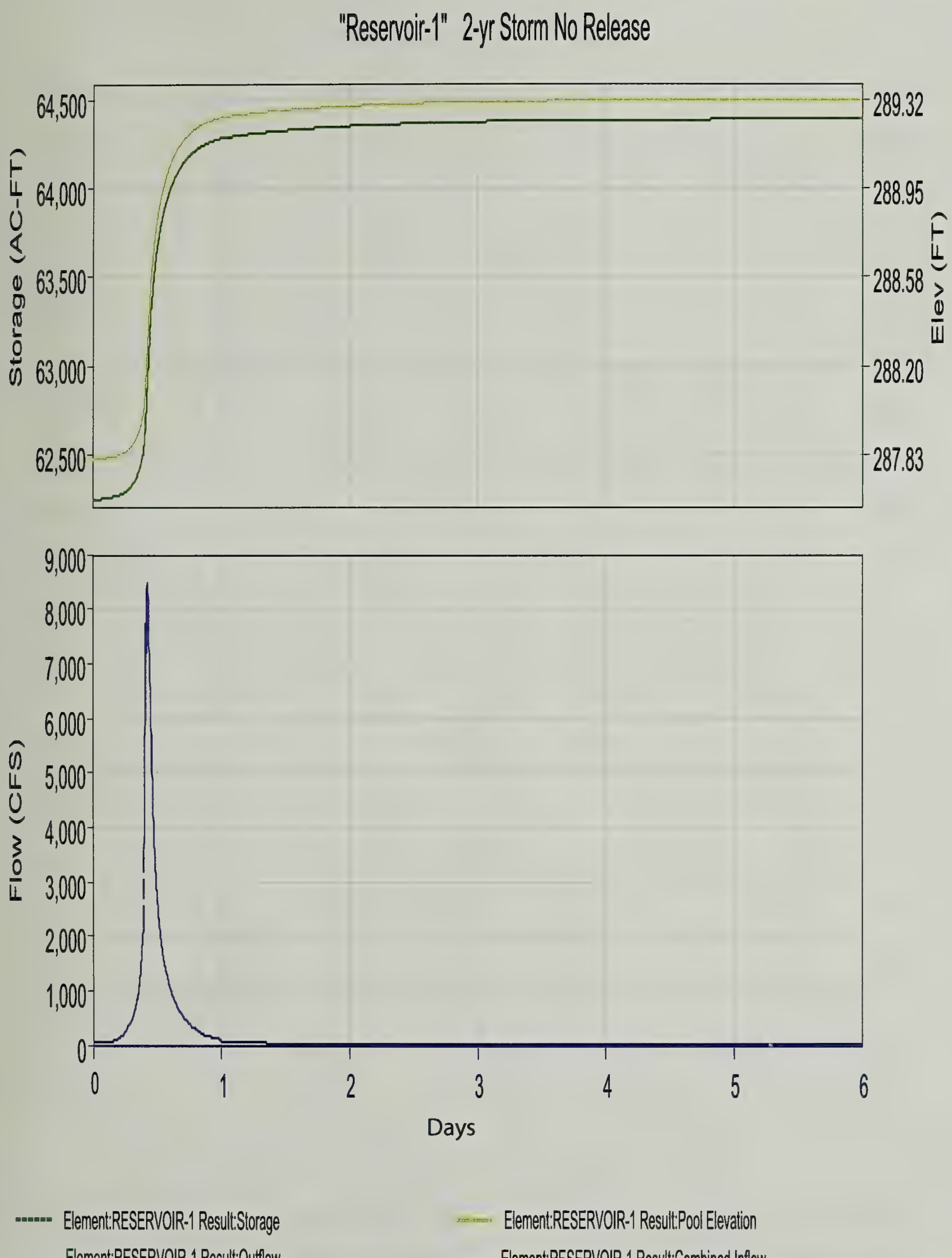


Release of 400 cfs for first 6 hours, then 600 cfs for Remainder of Simulation

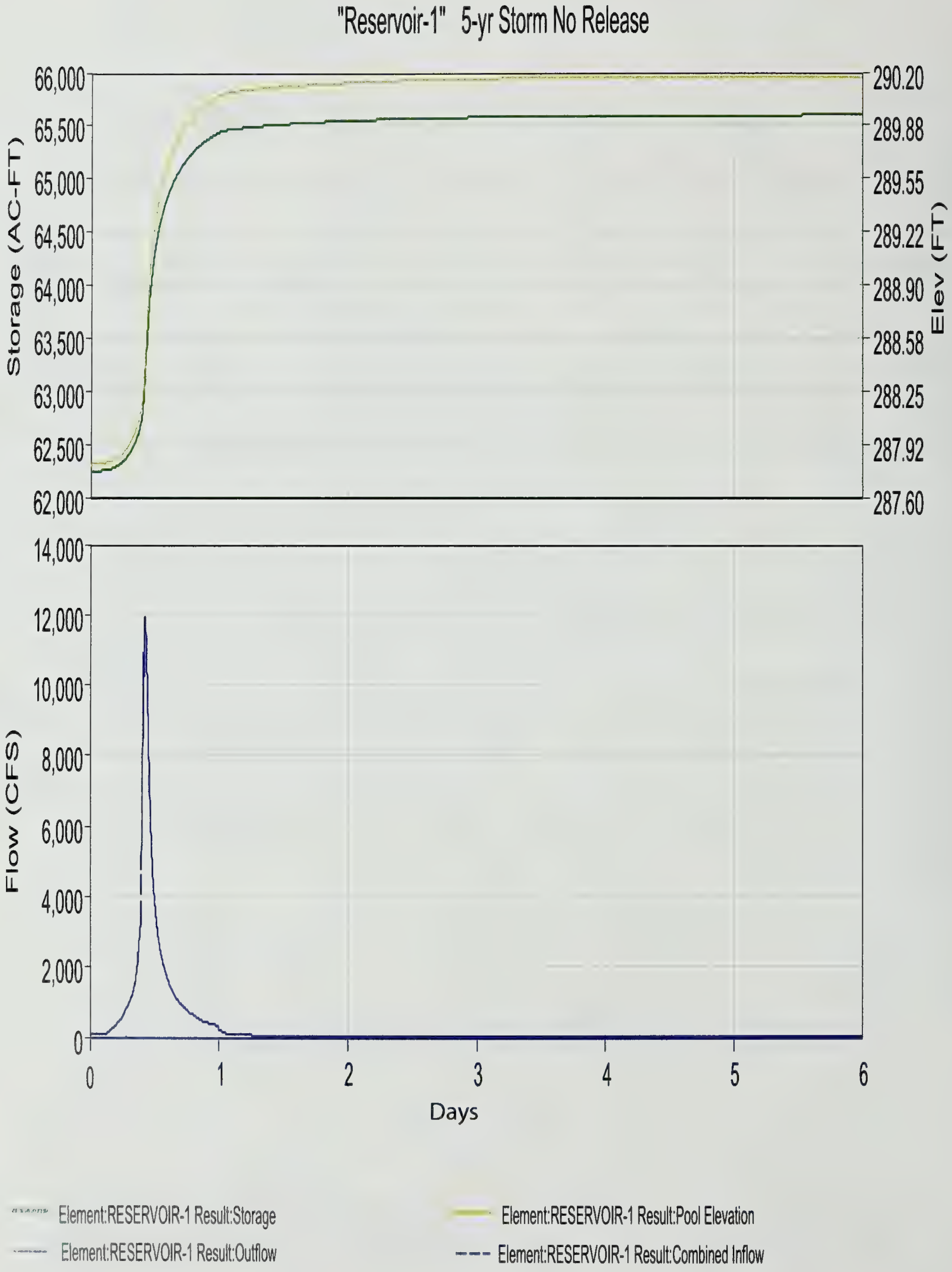


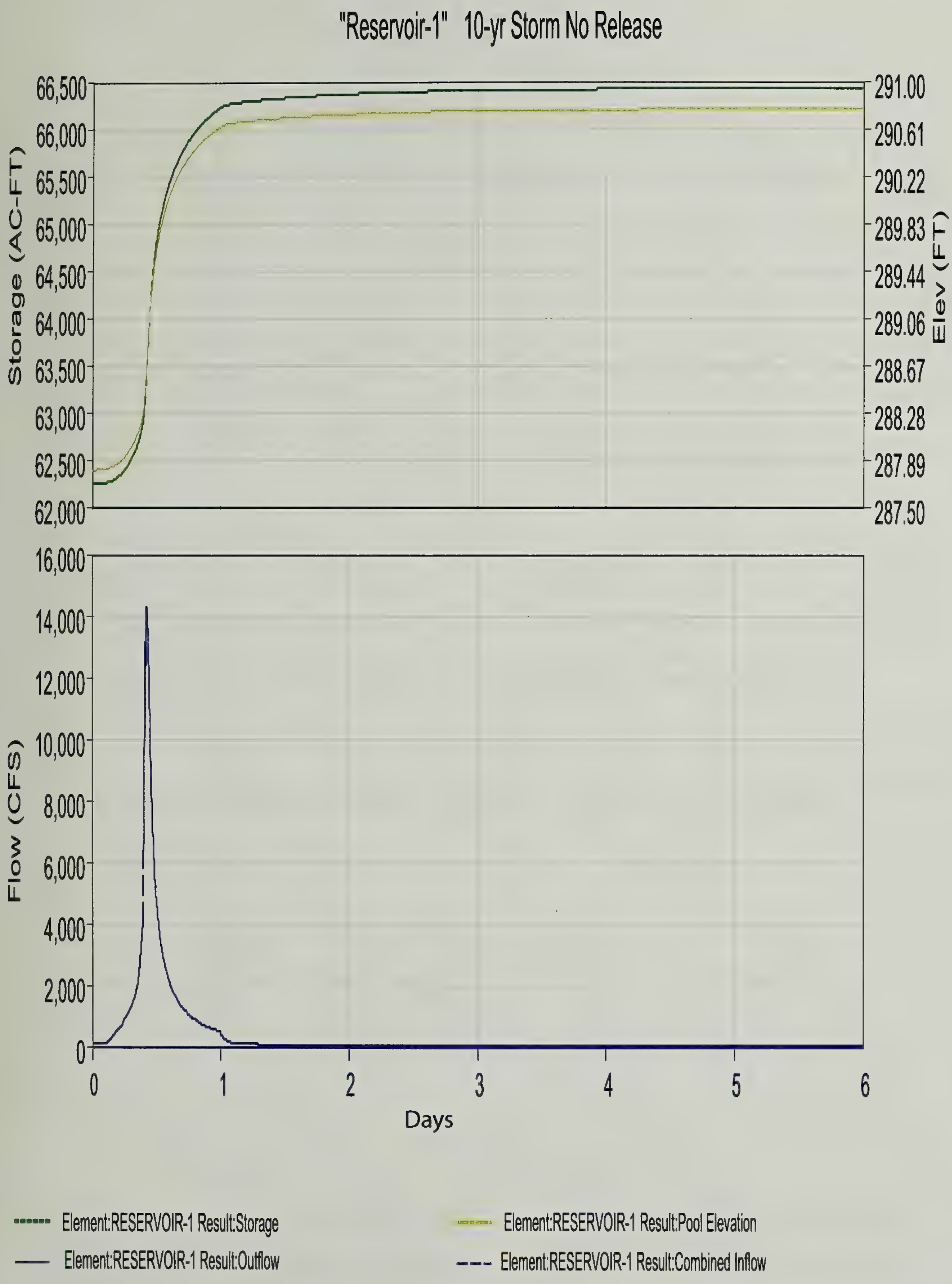
Release of 400 cfs for first 6 hours, then 600 cfs for Remainder of Simulation

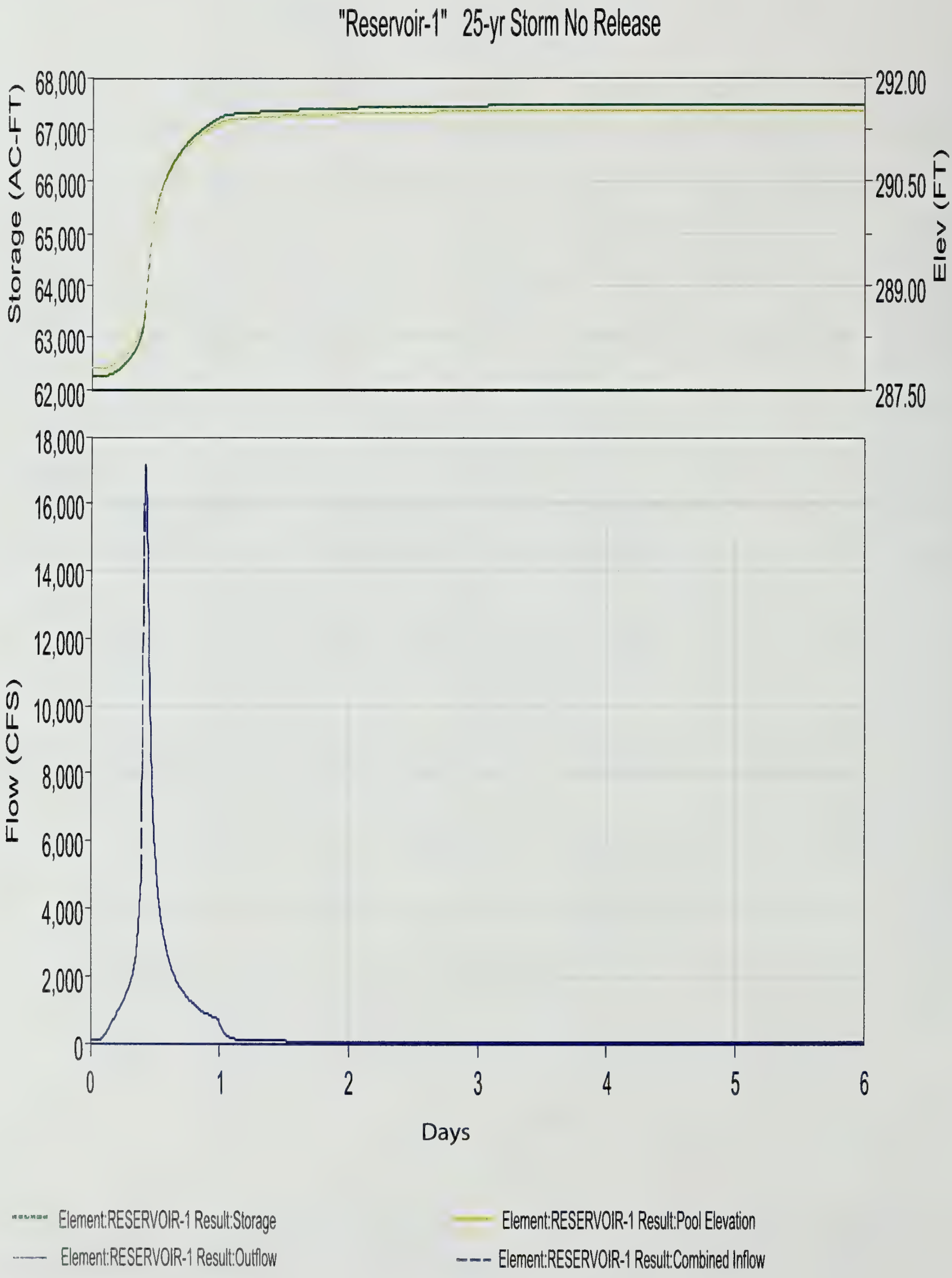


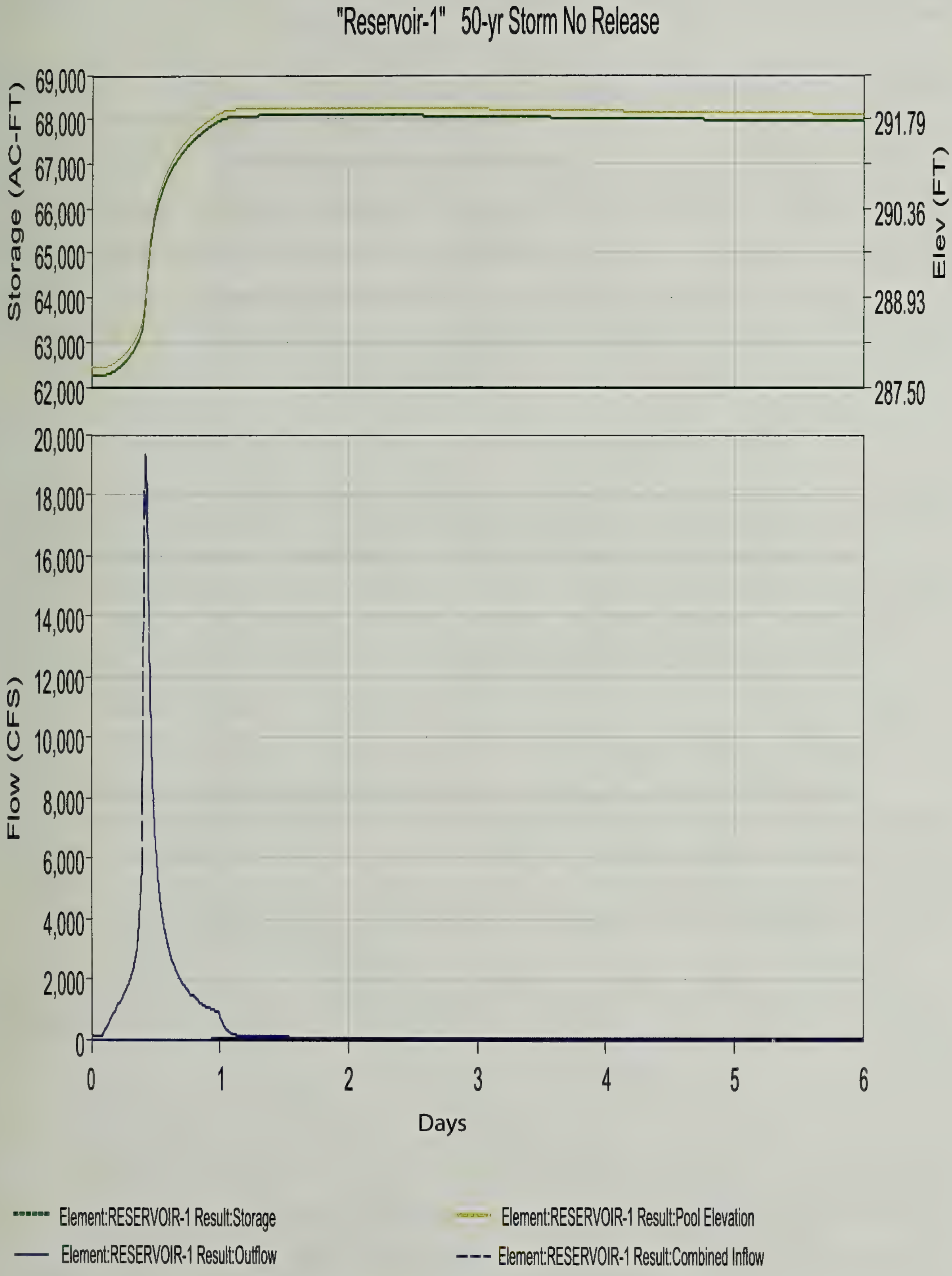

"Reservoir-1" 2-yr Storm No Release
Storage (AC-FT)
64,500
64,000
63,500
63,000
62,500
Elev (FT)
289.32
288.95
288.58
288.20
287.83
Flow (CFS)
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
0
1
2
3
4
5
6
Days
Element:RESERVOIR-1 Result:Storage
Element:RESERVOIR-1 Result:Pool Elevation
Element:RESERVOIR-1 Result:Outflow
Element:RESERVOIR-1 Result:Combined Inflow

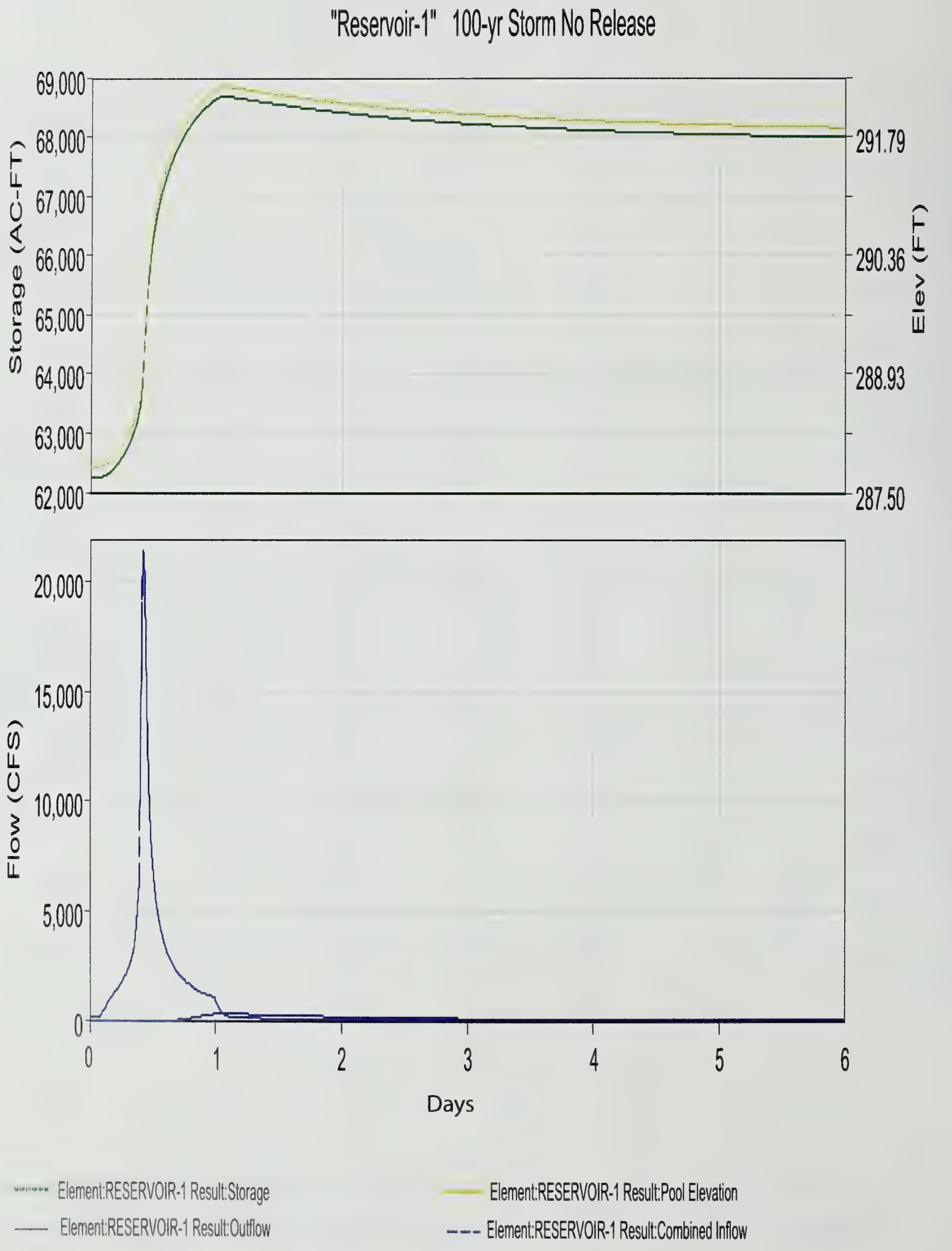
Attachment B: Scenario 2 Model Results
No Release for Duration of Simulation


"Reservoir-1" 5-yr Storm No Release


"Reservoir-1" 10-yr Storm No Release
Storage (AC-FT)
66,500
66,000
65,500
65,000
64,500
64,000
63,500
63,000
62,500
62,000
Elev (FT)
291.00
290.61
290.22
289.83
289.44
289.06
288.67
288.28
287.89
287.50
Flow (CFS)
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
0
1
2
3
4
5
6
Days
Element:RESERVOIR-1 Result:Storage
Element:RESERVOIR-1 Result:Pool Elevation
Element:RESERVOIR-1 Result:Outflow
Element:RESERVOIR-1 Result:Combined Inflow


"Reservoir-1" 25-yr Storm No Release
Storage (AC-FT)
68,000
67,000
66,000
65,000
64,000
63,000
62,000
Elev (FT)
292.00
290.50
289.00
287.50
Flow (CFS)
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
0
1
2
3
4
5
6
Days
Element:RESERVOIR-1 Result:Storage
Element:RESERVOIR-1 Result:Pool Elevation
Element:RESERVOIR-1 Result:Outflow
Element:RESERVOIR-1 Result:Combined Inflow


"Reservoir-1" 50-yr Storm No Release
Storage (AC-FT)
69,000
68,000
67,000
66,000
65,000
64,000
63,000
62,000
Elev (FT)
291.79
290.36
288.93
287.50
Flow (CFS)
20,000
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
0
1
2
3
4
5
6
Days
Element:RESERVOIR-1 Result:Storage
Element:RESERVOIR-1 Result:Pool Elevation
Element:RESERVOIR-1 Result:Outflow
Element:RESERVOIR-1 Result:Combined Inflow


"Reservoir-1" 100-yr Storm No Release
Storage (AC-FT)
69,000
68,000
67,000
66,000
65,000
64,000
63,000
62,000
Elev (FT)
291.79
290.36
288.93
287.50
Flow (CFS)
20,000
15,000
10,000
5,000
0
0
1
2
3
4
5
6
Days
Element:RESERVOIR-1 Result:Storage
Element:RESERVOIR-1 Result:Pool Elevation
Element:RESERVOIR-1 Result:Outflow
Element:RESERVOIR-1 Result:Combined Inflow

Technical Memorandum 3

Adjustment of HH/LSM Model Results to Reflect Actual Operation of Crystal Springs Reservoir

Subject:	**Adjustment of HH/LSM Model Results to Reflect Actual Operation of Crystal Springs Reservoir**
Job	**Lower Crystal Springs Dam EIR**
Prepared By:	Brent Johnson, P.E.
Reviewed By:	Beth Goldstein, P.E., John Davis (Orion)
Date:	December 15, 2009
Reference:	070008, SFPUC Agreement No. CS-883A.7

1 INTRODUCTION

This memorandum outlines a hydrologic modeling effort conducted by Hydroconsult Engineers (HCE) on behalf of the ESA Orion JV for the Lower Crystal Springs Dam (LCSD) EIR, a San Francisco Public Utilities Commission (SFPUC) project. The analysis performed involved review of water levels in Lower Crystal Springs Reservoir using Hetch-Hetchy/Local Simulation Model (HH/LSM) data and the application of scaling factors to the data. The scaling factors were applied to more accurately reflect actual operation of the reservoir, compared to the ideal operation reflected by HH/LSM results. This methodology was first proposed by the SFPUC in a memo dated May 8, 2009 by David Cameron.

Two methods of scaling were explored. The first methodology was similar to that proposed by the SFPUC and involved a single scaling factor applied on a monthly basis. The second methodology involved development of a scaling factor according for each of the five hydrologic year-types commonly discussed when reviewing HH/LSM data, namely wet, above normal, normal, below normal, and dry. For both methodologies, the scaling factors were applied to the HH/LSM model output data, allowing for analysis of existing condition and with-project water levels over the full 82-year dataset.

Data and background documents relied upon to develop the scaling factors and the 82-year dataset included:

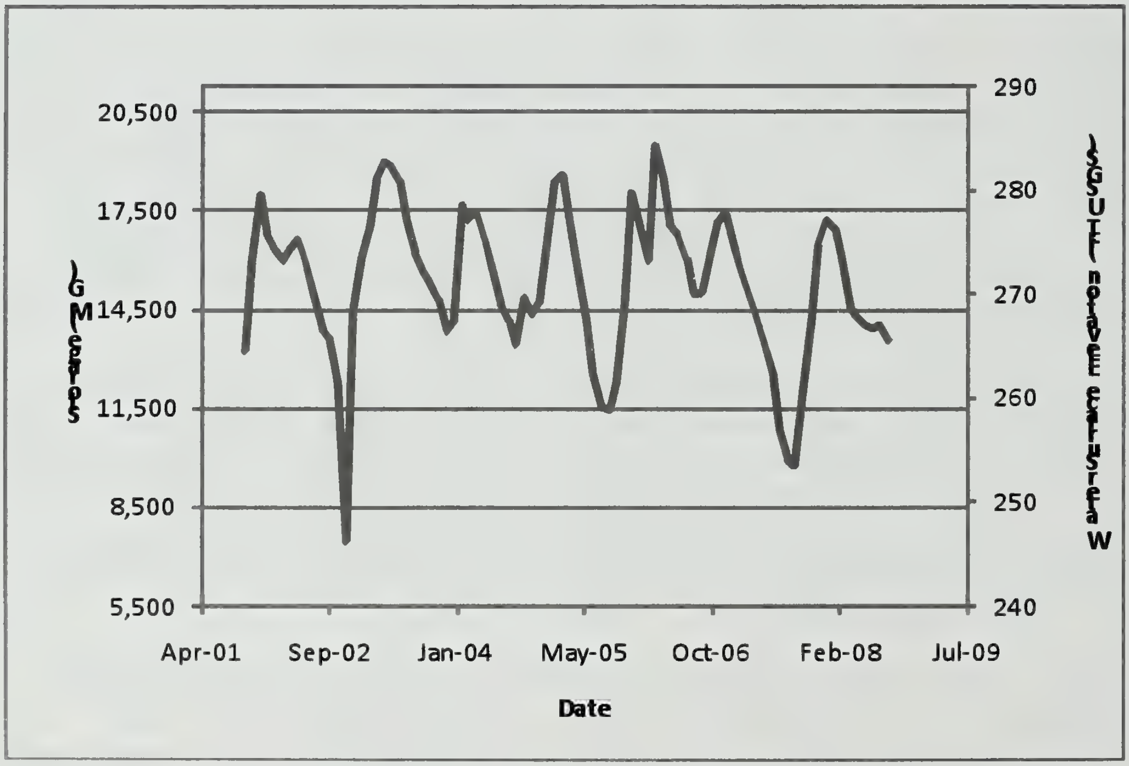
- HH/LSM Output Data, provided in Microsoft Excel Format (LCSDIP Variant (Steiner_01_25_09).xls)
- SFPUC Memo from David Cameron (Attachment A)
- Historical reservoir level information from the California Data Exchange Center (CDEC)
- Stage-storage information for Crystal Springs Reservoir based on bathymetric and LIDAR surveys

Ultimately the SFPUC scaling method was chosen as the preferred methodology for analysis of actual water levels with implementation of the LCSD Improvement Project.

2 METHODOLOGY

Historical storage for CSR was reviewed over the timeframe between Water Year (WY) 2002 and 2008. As outlined in the SFPUC memo, this is the time period during which Calaveras Reservoir has also been operated under a DSOD restriction, and therefore operation of the system has been somewhat stable except for fluctuations that could reasonably be expected to occur over the course of typical operations. Reservoir storage data over this period was sourced from CDEC and collected as average monthly surface elevations. Figure 1 presents the CDEC water surface data as monthly average storage.

Figure 1 – Crystal Springs Reservoir Storage, Water Year 2002 to 2008



Source: CDEC, May 2009

Similar data is presented in Figure 1 of the SFPUC memo, including an explanation of the operational reasons for the fluctuations in water levels and an overlay of HH/LSM modeled operational levels for the same period.

2.1 Method 1 - Scaling by Month (SFPUC Method)

The SFPUC method of developing scaling factors on a monthly basis is explained in detail in the SFPUC Memo provided as Attachment A. The SFPUC developed the scaling factors by first determining the average, maximum and minimum storage values for each month in the 82-year dataset of the HH/LSM baseline condition. The same was done for actual data between WY 2002 and 2008. Average, maximum and minimum scaling factors were then established by dividing the observed values by the modeled base setting values. Table 1 presents the scaling factors developed by the SFPUC.

Table 1 – Crystal Springs Reservoir Storages (Base Setting and Observed, MG) and Scaling Factors, SFPUC Methodology

	Model Base Setting			Observed WY 02-08			Scaling Factor[1]		
	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min
Oct	16,217	16,535	15,010	13,238	15,612	10,514	0.82	0.94	0.70
Nov	15,867	16,520	15,117	14,291	16,601	11,756	0.90	1.00	0.78
Dec	16,358	18,520	15,355	15,085	17,209	12,512	0.92	0.93	0.81
Jan	17,012	18,613	15,547	16,483	18,321	14,042	0.97	0.98	0.90
Feb	17,199	20,507	15,221	16,491	17,368	15,634	0.96	0.85	1.03
Mar	16,407	18,520	14,460	17,065	18,428	15,484	1.04	1.00	1.07
Apr	17,203	18,520	15,000	16,934	18,676	14,542	0.98	1.01	0.97
May	17,074	18,520	15,000	16,459	19,114	13,966	0.96	1.03	0.93
Jun	16,179	18,520	15,035	15,691	18,570	12,976	0.97	1.00	0.86
Jul	15,628	18,391	15,000	14,825	17,774	11,794	0.95	0.97	0.79
Aug	15,324	17,520	15,000	13,854	16,728	10,257	0.90	0.95	0.68
Sep	15,854	16,800	15,365	13,293	15,881	9,722	0.84	0.95	0.63
Annual	16,360	20,507	14,460	15,309	19,114	9,722	n/a	n/a	n/a

[1] Calculated from Observed / Base.

Source: Table 2a, SFPUC Memo, David Cameron, May 8, 2009

SFPUC scaling factors for the "average" condition (highlighted in Table 1) were utilized in this analysis to scale modeled storage for the baseline and with-project condition. The average scaling factor was applied to the HH/LSM dataset by multiplying the scaling factor by the corresponding modeled value for each month of the 82-year dataset. Results of this analysis are presented as Attachment B.

2.2 Method 2 - Scaling by Year-Type

A second methodology was developed to attempt to refine the SFPUC method according to the hydrologic year-type. Hydrologic year-types have been developed in other analyses of HH/LSM data and were established by ranking of the 82-years in the dataset into 20th percentiles, from wettest to driest based on total annual inflow (in a water year) to the five Bay Area reservoirs. The percentiles are designated wet, above normal, normal, below normal, and dry.

In this methodology, water years 2002 to 2008 were designated into one of the hydrologic year-types according to the inflow method. Hydrologic year-types for these years in the observed dataset are:

2002	Below Normal (BN)
2003	Normal (N)
2004	Normal (N)
2005	Above Normal (AN)
2006	Above Normal (AN)
2007	Dry (D)
2008	Normal (N)

Scaling factors for each month of each year-type were then calculated by dividing the observed value by average values for each hydrologic year-type in the baseline condition of HH/LSM modeled values. Note that a wet year was not present in the observed data and the above normal scaling values were used for wet years. When multiple year-types were present in the dataset, scaling factors reflect the average of the multiple years. Table 2 presents the results of this analysis.

Table 2 – Crystal Springs Reservoir Storages (Base Setting and Observed, MG) and Scaling Factors, Year-type Methodology

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	
HHLSM Baseline, Level by Year Type (MG)													
2002	16,520	15,925	16,520	16,401	15,344	14,994	15,494	15,163	15,062	15,086	15,051	15,365	Modeled
2003	16,324	15,912	16,447	17,030	17,167	16,380	17,387	17,272	16,307	15,561	15,232	15,789	N
2004	16,324	15,912	16,447	17,030	17,167	16,380	17,387	17,272	16,307	15,561	15,232	15,789	N
2005	16,035	15,782	16,305	17,449	18,036	16,989	18,012	17,837	16,527	15,521	15,104	15,904	AN
2006	16,035	15,782	16,305	17,449	18,036	16,989	18,012	17,837	16,527	15,521	15,104	15,904	AN
2007	16,293	15,931	16,210	16,399	16,164	15,351	16,140	16,102	15,901	16,059	15,921	16,086	D
2008	16,324	15,912	16,447	17,030	17,167	16,380	17,387	17,272	16,307	15,561	15,232	15,789	N
Recorded Monthly Storage in CSR, From CDEC (MG)													
2002	13251	15950	18005	16790	16286	15982	16302	16626	16045	14839	13899	13615	BN
2003	12254	7463	14393	16045	17022	18371	18957	18850	18354	17222	16237	15635	N
2004	15294	14764	13814	14058	17661	17188	17492	16594	15697	14689	14159	13447	N
2005	14861	14320	14644	16741	18319	18565	17222	15666	14159	12545	11535	11434	AN
2006	12228	14749	18074	16989	15982	19501	18424	17088	16724	16045	14989	14959	AN
2007	16237	17088	17424	16334	15792	14959	14422	13531	12545	10817	9942	9690	D
2008	12046	14188	16398	17222	16955	16013	14629	14246	13986	13871	13986	13587	N
Scaling Factor													
2002	0.80	1.00	1.09	1.02	1.06	1.07	1.05	1.10	1.07	0.98	0.92	0.89	BN
2003	0.75	0.47	0.88	0.94	0.99	1.12	1.09	1.09	1.13	1.11	1.07	0.99	N
2004	0.94	0.93	0.84	0.83	1.03	1.05	1.01	0.96	0.96	0.94	0.93	0.85	N
2005	0.93	0.91	0.90	0.96	1.02	1.09	0.96	0.88	0.86	0.81	0.76	0.72	AN
2006	0.76	0.93	1.11	0.97	0.89	1.15	1.02	0.96	1.01	1.03	0.99	0.94	AN
2007	1.00	1.07	1.07	1.00	0.98	0.97	0.89	0.84	0.79	0.67	0.62	0.60	D
2008	0.74	0.89	1.00	1.01	0.99	0.98	0.84	0.82	0.86	0.89	0.92	0.86	N
Scaling Factors by Year Type													
D	1.00	1.07	1.07	1.00	0.98	0.97	0.89	0.84	0.79	0.67	0.62	0.60	
BN	0.80	1.00	1.09	1.02	1.06	1.07	1.05	1.10	1.07	0.98	0.92	0.89	
N	0.81	0.76	0.90	0.93	1.00	1.05	0.98	0.96	0.98	0.98	0.97	0.90	
AN	0.84	0.92	1.00	0.97	0.95	1.12	0.99	0.92	0.93	0.92	0.88	0.83	
W	0.84	0.92	1.00	0.97	0.95	1.12	0.99	0.92	0.93	0.92	0.88	0.83	

Note: D = Dry, BN = Below Normal, N = Normal, AN = Above Normal, W = Wet
No Wet years occurred during 2002-2008 study period. Above Normal scaling factor values were used for Wet year values.

Similar to the first methodology, these scaling factors were then applied to the modeled baseline and with-project condition dataset by multiplying the storage value for each month by the scaling factor, with the additional refinement of correlating year-types in the dataset with the corresponding scaling factors for that year-type. Results of this analysis are presented as Attachment C.

2.3 Model Data

As discussed in the preceding sections, HH/LSM model data were used in the development of scaling factors as well in the analysis of with-project water levels. Two model runs were used in this analysis as outlined in Table 3.

Table 3 – HH/LSM Model Runs Used in the Analysis

Model Run	Description
Baseline (2005)	The baseline ("existing") condition assumed the existing system configuration and the baseline water system demand of 265 MGD. The Crystal Springs Reservoir (CSR) maximum operating elevation for this scenario was modeled as 283.8 ft/18.52 BG with a 2 BG winter buffer. In this setting, Calaveras Reservoir is assumed to operate under the Department of Safety of Dams (DSOD) restriction with a maximum operating storage of 12.4 BG. No maintenance schedules (e.g. no Hetch Hetchy, HH, shutdowns or local maintenance) are included in the baseline setting.
With-Project (LCSDI Project Variant (2018))	The with-project condition assumes future WSIP improvements to the system with the customer purchase request limited by the terms of the existing Master Water Sales Agreement through 2018, assumed to amount to net 265 MGD of system demand. The 265 MGD demand is after an offset of 10 MGD of recycled water, groundwater, and conservation projects in San Francisco. Under this scenario, Calaveras Reservoir is restored to full operating capacity (31.5 BG). The Crystal Springs Reservoir maximum operating storage is modeled as 20.28 BG (equivalent to an elevation of 287.8 ft). This setting also includes a HH shutdown (curtailment of HH supplies) during the months of November and December every 5 years.

Note that the with-project modeled condition includes a curtailment of supplies to CSR from Hetch Hetchy every 5 years in November and December. For both methodologies, these curtailments have been removed from the with-project model results and replaced with average values from preceding and following years for the months of November and December. This removal of variability from the model results was proposed by the SFPUC in their May 2009 memo to prevent "double-counting" and has been carried through into this analysis.

2.4 Analysis of Modified With-Project Model Data

The results of applying the scaling factors to the with-project model data are presented in Attachments B and C. HH/LSM model results have been analyzed according to the analysis procedures developed during the WSIP EIR and include a number of different presentations of the data. The first analysis (Tables and Charts 1 and 2) is a summary of average monthly storage and water level in the reservoir under the baseline and with-project condition and the calculated percent change from the baseline. Chart 3 presents water level in the reservoir over the 82-year dataset for both the with-project and baseline condition. Table 3 presents an analysis of the time that an elevation within the reservoir fluctuation zone will be inundated in the baseline and with-project conditions. Table 4 presents all monthly water level values for the 82-year dataset as well as the change between the baseline and with-project condition.

3 DISCUSSION OF RESULTS

3.1 Method 1, Scaled by Month

Scaling factors developed according to the first method proposed by the SFPUC reduce the modeled values in all months of the year except for March (scaling factors range from 0.82 to 1.04, see Table 1). As such, the comparison of the baseline and with-project conditions scaled by this methodology predicts less frequent inundation of elevations in the range from elevation 287.5 to 273 feet, than was the case using the unscaled model results. Appendix D includes the results of the HH/LSM analysis without scaling factors to aid the comparison. The changes to frequency of inundation can be noted in Table 3 in Appendix B and D. Also notable on the tables are a few days in the scaled condition with increased frequency of inundation above 287.5 when compared with the unscaled model results. This is the result of the one month (March) with a scaling factor greater than 1.

3.2 Method 2, Scaled by Year Type

Review of the second, year-type methodology reveals much higher variability in water levels as is illustrated on Chart 3 when comparing the scaled results in Appendix C with the unscaled results in Appendix D. This is explained by several of the scaling factors in the year-type methodology being greater than one, with a range from 0.60 to 1.12 (see Table 2). Also notable on Chart 3 is that the with-project condition often exceeds the maximum targeted storage of the reservoir (287.8 ft) in approximately half of the years. Further, the with-project storage also exceeds the spillway height (291.8) in a few years of the dataset. This is a result of the high scaling factors in the this methodology.

This methodology results in inundation occurring above 287.5 in a number of the months where under the unscaled model results no inundation is predicted above 287.5. This methodology was ultimately discounted due to the frequency of spikes above the targeted operational level of the reservoir. Through discussion with SFPUC personnel, it is believed that this method overpredicts the amount of time that water surface levels would exceed the targeted operating level.

ATTACHMENTS

ATTACHMENT A	SFPUC Memo from David Cameron, Operating Range of Crystal Springs Reservoir
ATTACHMENT B	Adjusted HH/LSM Results, Method 1 – Monthly Scaling Methodology (SFPUC Method)
ATTACHMENT C	Adjusted HH/LSM Results, Method 2 – Year Type Scaling Methodology
ATTACHMENT D	HH/LSM Data Analysis, No Scaling

Water Supply & Treatment Division
Interoffice Memorandum

Date: **May 8, 2009**

To: **David A. Briggs**
Cc: **Anna Roche and Ellen Levin**

From: **David S. Cameron** David Cameron DC 1/19/10

Subject: **Operating Range of Crystal Springs Reservoir, Comparison of Observed and Modeled Data and Refinement of HH/LSM Output for Crystal Springs Reservoir Storage and Elevation**

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1. Objective

The purpose of this memorandum is as follows:

- Compare the range of the Crystal Springs Reservoir data obtained from the Baseline Setting (described in the January 29th memorandum and summarized in Table 2) with a range obtained from an appropriate period of observed data.
- Identify why differences between the observed and modeled ranges occur.
- Present a robust, quantified approach for refining modeled data to compensate for known modeling limitations, particularly data associated with reservoir storage and elevation so that modeled project scenarios are as accurate as possible.

2. Introduction and Assumptions

The January 29, 2009 memorandum "Lower Crystal Springs Dam Improvement Project Variant Operation" by Daniel B Steiner describes the simulation of Crystal Springs Reservoir storages using the Hetch Hetchy and Local Simulation Model (HH/LSM). HH/LSM is a system-wide monthly time-step operations planning tool used by the SFPUC. HH/LSM uses the recorded 82-year historical hydrology (1921-2002) to simulate project operations with a fixed level of demand and system configuration. The utility of model simulations is the comparison of results between different scenarios of system configuration, water demand and system operation.

The January 29, 2009 memorandum describes the simulation results for several different model scenarios (or Settings). These Settings include:

- The Baseline ("existing") Condition that assumed the existing system configuration and the baseline water system demand of 265 MGD. The Crystal Springs Reservoir (CSR) maximum operating elevation for this scenario was modeled as 283.8 ft/18.52 BG with a 2 BG winter buffer. In this Setting, Calaveras reservoir is assumed to operate under the Department of Safety of Dams, DSOD, restriction with a maximum operating storage of 12.4 BG. No maintenance schedules (e.g. no Hetch Hetchy, HH, shutdowns or local maintenance) are included in the Baseline Setting.

- A revised Water Supply Improvement Project (WSIP) 2018 Setting (entitled the "2018 Restricted Crystal Springs" Setting). This Setting assumes future WSIP improvements to the system with the customer purchase request limited by the terms of the existing Master Water Sales Agreement through 2018, assumed to amount to net 265 MGD of system demand after an offset of 10 MGD of recycled water, groundwater, and conservation projects in San Francisco. Calaveras Reservoir is restored to full operating capacity (31.5 BG) with the California Department of Fish and Game Memorandum of Understanding (MOU) in-stream flow objectives being supplemented from that reservoir and recaptured for treatment at Sunol Valley Water Treatment Plant (SVWTP). The Crystal Springs Reservoir maximum operating storage is modeled as 20.28 BG (equivalent to an elevation of 287.8 ft). This Setting also includes a HH shutdown (curtailment of HH supplies) during the months of November and December every 5 years.

In producing system-wide simulations, HH/LSM uses a set of preferred operating storages for each reservoir on a monthly basis (see Table 1 for the preferred operating storages or "rule curve" used in the Baseline and the 2018 Restricted Crystal Springs Settings described in the January 29th memorandum). Tables 2a and 2b summarize the average, maximum and minimum Crystal Springs Reservoir storages and elevations obtained from the Baseline Setting as described in the January 29th memorandum.

In addition, because it is a long term planning model, HH/LSM cannot account for unscheduled maintenance events (such as unforeseen pipeline shutdowns) which can affect system operations. This can result in certain reservoir storages (such as at Crystal Springs) being modeled within an operating range which is narrower than in observed conditions.

3. Analysis Results

3.1 Comparison of the Base Setting with Observed Data

The period of observed data record selected for analysis was October 2001 to September 2008 (i.e. Water Years 2002 through 2008). The reason for choosing this period was that it encompasses the period of time during which Calaveras was operated under the DSOD restriction.

A summary of the average, maximum and minimum observed Crystal Springs average monthly storages and elevations is shown in Tables 2a and 2b. A comparison of these values with the equivalent values obtained for the Base Setting indicates that the observed operating range is wider than the modeled range. In particular, the minimum summer storages are smaller in the observed data than in the modeled data.

The difference in the range between the modeled and observed baseline data can be explained by the model's idealized range of preferred operating storages. Figure 1 illustrates this by comparing the model's preferred Crystal Springs operating elevations (converted from the Baseline Setting storage values on Table 1) with the observed average monthly elevations for Water Years 2002 through 2008. Explanatory text is provided to describe the actual system operations which contributed to the Crystal Springs storage values.

In considering the results shown on Figure 1 it is highlighted that, although Crystal Springs Reservoir does receive input from local runoff (and in some cases diversions from Pilarcitos Reservoir), a large amount of inflow is due to the transfer in of HH or east bay water to the reservoir at the Pulgas overflow facility. The San Joaquin pipeline (SJPL) and Coast Range Tunnel flow rates are therefore an important control on the input of water to Crystal Springs Reservoir. If SJPL rates are lower than planned due to extended maintenance on the HH side of the system (e.g. in 2005, the SJPL did not increase to its maximum rate of 290 MGD until June 2005), then the refill of the reservoir will be affected.

3.2 Refining the 2018 Restricted Crystal Springs Results

The comparison results between the observed data and the Baseline Setting demonstrate that there is a larger range of operating storages and elevations in the observed data than in the Baseline Setting (Figure 1 and Tables 2a and 2b). As described above, these results can largely be attributed to actual maintenance and unplanned outage issues which were not included in the model.

To enhance interpretation of the modeling results, allowances for these unforeseen maintenance issues can be made for the modeled Base and any proposed project simulations, including the 2018 Restricted Crystal Springs project. However, because of the unpredictable nature of the previously experienced unplanned outages and maintenance actions, and the complexity of the system wide model, the ***direct*** inclusion of such events in the model is not practical. Instead, an alternative approach has been adopted in this memorandum.

The proposed approach involves post-processing the model output to refine the simulation using information from the baseline observed data. This is achieved as follows:

1. Produce a set of monthly scaling factors. This is achieved by dividing the observed average, maximum and minimum monthly values by the corresponding values for the Baseline Setting (Tables 2a and 2b).

2. Remove the HH shutdowns from the output of the 2018 Restricted Crystal Springs Setting (Table 3) and recalculate the average, maximum and minimum monthly values from that new dataset (Tables 3 and 4). This step is needed in order to prevent the "double-counting" of HH shutdowns (as there are HH shutdowns in both the observed dataset and in the initial output from the 2018 Restricted Crystal Springs Setting).

3. Produce a refined set of revised WSIP 2018 Setting results. This is achieved by multiplying the new average, maximum and minimum monthly WSIP values obtained in step 2 by the calibration factors obtained in step 1.

4. Derive annual values from the calibrated 2018 Restricted Crystal Springs Setting monthly values (Table 4).

5. Convert to elevation to facilitate environmental impact analysis (Table 5).

The output from the procedure is listed in Tables 4 and 5. In addition, the calibrated 2018 Restricted Crystal Springs Setting annual values are also summarized below:

- Average elevation/storage of 281.9 ft/17,721 MG.
- Maximum elevation/storage of 289.2 ft/20.930 MG.
- Minimum elevation/storage of 264.5 ft/11,573 MG.

This results in an operating elevation range of between 264.5 ft and 289.2 ft. This range of 24.7 ft is similar to the range of 27 ft obtained for the observed data (between the minimum and maximum values of 257.2 ft and 284.2 ft for Water Years 2002 to 2008, Figure 1 and Table 2b).

Table 1: HH/LSM Preferred Operating Storages (Base and 2018 Restricted Crystal Springs)

	Base	2018 Restricted Crystal Springs
Oct	16,520	18,280
Nov	16,520	18,280
Dec	16,520	18,280
Jan	16,520	18,280
Feb	16,520	18,280
Mar	16,520	19,000
Apr	18,520	20,280
May	18,520	20,280
Jun	18,520	20,280
Jul	18,520	20,280
Aug	17,520	19,600
Sep	16,520	18,900

Table 2a: Crystal Springs Reservoir Storages (Base Setting and Observed, MG) and Scaling Factors

	Model Base Setting			Observed WY 02-08			Scaling Factor[1]		
	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min
Oct	16,217	16,535	15,010	13,238	15,612	10,514	0.82	0.94	0.70
Nov	15,867	16,520	15,117	14,291	16,601	11,756	0.90	1.00	0.78
Dec	16,358	18,520	15,355	15,085	17,209	12,512	0.92	0.93	0.81
Jan	17,012	18,613	15,547	16,483	18,321	14,042	0.97	0.98	0.90
Feb	17,199	20,507	15,221	16,491	17,368	15,634	0.96	0.85	1.03
Mar	16,407	18,520	14,460	17,065	18,428	15,484	1.04	1.00	1.07
Apr	17,203	18,520	15,000	16,934	18,676	14,542	0.98	1.01	0.97
May	17,074	18,520	15,000	16,459	19,114	13,966	0.96	1.03	0.93
Jun	16,179	18,520	15,035	15,691	18,570	12,976	0.97	1.00	0.86
Jul	15,628	18,391	15,000	14,825	17,774	11,794	0.95	0.97	0.79
Aug	15,324	17,520	15,000	13,854	16,728	10,257	0.90	0.95	0.68
Sep	15,854	16,800	15,365	13,293	15,881	9,722	0.84	0.95	0.63
Annual	16,360	20,507	14,460	15,309	19,114	9,722	n/a	n/a	n/a

[1] Calculated from Observed / Base.

Table 2b: Crystal Springs Reservoir Elevations (Base Setting and Observed, ft NGVD 1929)

	Model Base Setting Elev.			Observed WY 02-08 Elev.		
	Avg	Max	Min	Avg	Max	Min
Oct	278.3	279.1	275.1	268.6	275.6	259.9
Nov	277.4	279.1	275.4	271.7	278.1	264.2
Dec	278.6	283.9	276.0	273.9	279.7	266.5
Jan	280.3	284.1	276.5	277.7	282.4	271.2
Feb	280.8	288.3	275.6	277.8	280.1	275.6
Mar	278.8	283.9	273.5	279.2	282.6	275.2
Apr	280.8	283.9	275.0	278.9	283.2	272.6
May	280.5	283.9	275.0	277.6	284.2	271.0
Jun	278.2	283.9	275.1	275.6	283.0	268.0
Jul	276.7	283.6	275.0	273.2	281.1	264.3
Aug	275.9	281.5	275.0	270.3	278.5	259.1
Sep	277.3	279.8	276.0	268.7	276.3	257.2
Annual	278.6	288.3	273.5	274.4	284.2	257.2

Table 3: 2018 Restricted Crystal Springs Storage (MG) – Showing the Removal of Months with HH Shutdowns

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	18,057	18,094	18,280	19,941	19,798	19,063	20,140	20,196	19,408	18,840	18,488	18,630
1922	18,175	18,083	18,280	18,280	20,280	19,167	20,104	20,227	19,313	18,752	18,405	18,679
1923	18,241	17,914	19,219	20,055	19,860	19,314	20,280	20,280	19,514	18,945	18,593	18,789
1924	18,280	18,153	18,207	18,280	17,802	18,331	19,446	19,795	19,323	18,985	18,837	18,900
1925	18,280			18,280	18,280	19,000	20,280	20,280	20,124	19,318	18,736	18,900
1926	18,280	18,280	17,299	18,280	19,141	19,018	20,186	20,280	19,683	19,111	18,756	18,618
1927	18,107	18,208	18,125	18,280	20,165	18,990	20,257	20,280	19,508	18,942	18,592	18,666
1928	18,218	18,132	17,890	18,280	18,280	19,000	20,280	20,280	19,476	18,906	18,554	18,721
1929	18,265	18,174	18,233	18,135	17,729	18,701	20,041	20,280	19,888	19,308	18,887	18,900
1930	18,280			18,259	18,280	19,000	20,275	20,280	19,870	19,291	18,934	18,900
1931	18,280	18,208	17,283	18,237	18,280	18,918	20,056	20,280	19,816	20,280	19,600	18,900
1932	18,253	18,193	18,280	18,267	18,987	19,276	20,280	20,280	19,687	18,888	18,287	18,464
1933	18,124	17,821	16,846	17,799	17,831	18,331	19,390	19,649	18,980	18,346	17,933	18,900
1934	18,280	18,280	18,280	18,280	18,190	18,929	20,144	20,280	19,885	19,601	19,454	18,900
1935	18,280			18,280	18,280	19,000	20,280	20,280	19,302	18,508	17,935	18,477
1936	18,280	17,980	17,049	18,003	19,072	19,000	20,280	20,280	19,381	18,812	18,461	18,725
1937	18,272	18,181	18,273	17,971	19,088	19,315	20,280	20,226	19,264	18,699	18,352	18,708
1938	18,280	18,218	18,280	18,268	20,280	20,280	20,251	20,280	19,338	18,784	18,441	18,775
1939	18,280	18,280	17,975	17,726	17,396	18,226	19,476	19,923	19,533	18,947	18,533	18,900
1940	18,280			18,280	19,383	19,000	20,280	20,226	19,273	18,713	18,368	18,630
1941	18,236	18,187	18,280	19,868	20,280	19,897	20,280	20,161	18,832	18,286	17,949	18,900
1942	18,280	18,280	18,280	20,280	20,280	19,000	20,280	20,243	19,009	18,455	18,113	18,874
1943	18,280	18,213	17,529	20,280	20,246	19,000	20,280	20,280	19,349	18,785	18,438	18,709
1944	18,280	18,275	17,848	18,131	18,280	19,000	20,280	20,280	19,504	18,931	18,578	18,565
1945	18,105			18,100	18,280	19,000	20,280	20,280	19,903	19,330	18,975	18,900
1946	18,197	17,695	19,095	19,888	18,997	18,986	20,280	20,280	19,512	18,942	18,590	18,531
1947	18,102	17,771	17,726	18,033	17,879	18,765	20,140	20,280	19,894	19,318	18,946	18,770
1948	18,010	17,941	17,057	17,878	18,035	18,826	20,280	20,280	19,887	19,616	19,472	18,900
1949	18,280	17,935	18,246	18,025	17,557	19,012	20,280	20,280	19,353	18,559	17,986	18,289
1950	18,225			18,096	18,280	18,796	19,884	20,138	19,530	18,953	18,598	18,900
1951	18,280	18,280	20,119	20,280	20,111	18,982	20,219	20,274	19,346	18,784	18,437	18,736
1952	18,280	18,261	18,280	20,280	20,280	19,930	20,211	20,280	19,367	18,813	18,470	18,586
1953	18,228	18,209	18,464	20,209	19,557	19,000	20,171	20,280	19,339	18,771	18,422	18,633
1954	18,223	18,280	18,280	18,160	18,280	19,154	20,280	20,280	19,507	18,935	18,582	18,585
1955	18,127			18,280	18,280	19,000	20,280	20,280	19,890	19,603	19,457	18,900
1956	18,280	18,280	20,280	20,280	20,280	18,994	20,264	20,280	19,411	18,632	18,066	18,448
1957	17,874	17,633	17,817	17,883	18,263	18,836	19,936	20,280	19,675	19,100	18,745	18,900
1958	18,280	18,241	17,538	18,280	20,280	20,280	20,280	20,262	19,104	18,556	18,217	18,900
1959	18,280	18,239	18,280	18,280	18,557	19,000	20,260	20,280	19,498	18,922	18,555	18,647
1960	18,208			17,902	18,280	18,921	20,142	20,280	19,879	19,543	19,395	18,900
1961	18,280	18,280	17,409	18,280	18,280	19,000	20,280	20,280	20,058	19,915	19,600	18,881
1962	18,235	18,176	18,253	18,280	18,297	19,035	20,280	20,280	19,690	18,891	18,315	18,562
1963	17,890	17,616	16,782	18,356	19,823	19,000	20,217	20,280	18,838	18,061	17,497	18,437
1964	18,280	18,280	18,280	18,254	17,468	17,948	18,993	19,246	18,585	17,955	17,546	18,635
1965	18,280			19,325	18,280	19,000	20,189	20,280	19,356	18,795	18,449	18,762
1966	18,280	18,070	18,280	18,266	18,173	18,931	20,131	20,280	19,888	19,308	18,889	18,900
1967	18,280	17,975	18,280	20,280	20,138	19,128	20,280	20,280	18,761	18,209	17,868	18,900
1968	18,280	18,251	17,453	18,280	17,972	18,933	20,278	20,280	19,894	19,318	18,962	18,900
1969	18,280	18,269	18,161	20,280	20,280	19,097	20,136	20,280	19,541	18,981	18,632	18,538
1970	18,162			18,280	18,058	19,000	20,280	20,280	19,508	18,937	18,587	18,574
1971	18,119	17,927	18,936	19,504	17,972	18,922	20,280	20,280	19,906	19,333	18,916	18,900
1972	18,280	18,211	18,280	18,006	17,606	18,232	19,439	19,862	19,403	18,763	18,343	18,900
1973	18,280	18,276	17,929	20,280	20,280	19,294	20,280	20,252	19,353	18,793	18,446	18,534
1974	18,182	18,148	19,315	20,280	18,318	18,994	20,280	20,280	19,355	18,814	18,471	18,629
1975	18,277			18,280	19,390	19,342	20,280	20,280	19,345	18,801	18,466	18,653
1976	18,280	18,274	17,393	18,195	18,280	18,897	20,042	20,280	19,812	19,474	19,326	18,900
1977	18,280	18,280	18,280	18,015	17,344	18,128	19,489	20,080	19,851	20,280	19,600	18,900
1978	18,252	18,193	17,502	19,040	20,280	20,055	20,240	20,280	19,726	18,940	18,369	18,669
1979	18,049	17,786	17,650	18,280	18,744	18,766	20,280	20,280	19,673	18,875	18,299	18,453
1980	17,799			18,280	20,280	18,990	20,259	20,280	19,403	18,846	18,501	18,639
1981	18,223	18,151	17,249	18,280	17,540	19,000	20,280	20,280	19,498	18,921	18,565	18,700
1982	18,215	18,280	18,280	20,280	20,280	19,000	20,280	20,280	19,059	18,511	18,171	18,900
1983	18,280	18,224	18,332	20,280	20,280	20,280	20,280	20,270	18,691	18,162	17,833	18,900
1984	18,280	18,280	20,174	20,182	18,161	18,907	20,254	20,280	19,906	19,335	18,921	18,900
1985	18,152			18,280	18,280	19,000	20,221	20,280	19,893	19,317	18,935	18,900
1986	18,280	18,280	17,396	18,224	20,280	20,280	20,280	20,239	19,319	18,763	18,418	18,745
1987	18,280	18,192	18,280	17,854	17,330	18,038	19,253	19,621	19,162	18,828	18,685	18,900
1988	18,280	17,938	17,154	17,704	17,485	18,250	19,630	20,220	19,993	20,280	19,600	18,900
1989	18,253	18,194	18,280	18,019	17,403	18,997	20,280	20,280	19,940	19,795	19,522	18,865
1990	18,220			18,280	18,280	19,000	20,280	20,280	20,280	19,909	19,368	18,858
1991	18,106	18,138	17,481	17,766	17,665	19,000	20,280	20,280	19,747	19,671	19,462	18,861
1992	18,219	18,160	18,267	18,043	18,280	19,000	20,187	20,259	19,670	19,992	19,516	18,869
1993	18,122	18,148	17,703	20,280	20,280	19,942	20,249	20,188	19,294	18,508	17,939	18,324
1994	18,280	18,019	18,179	18,201	18,280	18,746	19,785	20,050	19,437	19,167	19,023	18,900
1995	18,280			18,560	18,280	20,280	20,280	20,046	19,042	18,306	17,757	18,642
1996	18,280	18,049	17,548	19,246	20,280	19,119	20,280	20,280	19,375	18,600	18,033	18,421
1997	18,280	18,268	20,280	20,280	19,599	19,000	20,070	20,280	19,686	18,896	18,326	18,558
1998	18,280	17,779	17,421	20,272	20,280	19,000	20,280	20,280	19,356	18,659	18,130	18,650
1999	18,170	18,146	18,280	18,280	19,125	19,000	20,280	20,253	19,326	18,557	18,002	18,437
2000	18,280			17,870	18,382	19,000	20,270	20,187	19,298	18,517	17,949	18,415
2001	17,779	18,139	17,195	17,966	18,280	19,344	20,280	20,280	19,670	19,096	18,742	18,608
2002	18,111	18,091	18,280	18,280	17,804	18,915	20,210	20,280	19,891	19,311	18,941	18,900
Avg (21-02	18,214	18,127	18,104	18,708	18,827	19,049	20,143	20,217	19,510	18,990	18,598	18,733
Max (21-02	18,280	18,280	20,280	20,280	20,280	20,280	20,280	20,280	20,280	20,280	19,600	18,900
Min (21-02	17,779	17,616	16,782	17,704	17,330	17,948	18,993	19,246	18,585	17,955	17,497	18,289

Table 4: Summary of 2018 Restricted Crystal Springs Reservoir Storages (MG) following removal of HH shutdowns (from Table 3) and scaling (using factors from Table 2)

	Model 2018 Restricted CS[1]			Scaled 2018 Restricted CS[2]		
	Avg	Max	Min	Avg	Max	Min
Oct	18,214	18,280	17,779	14,868	17,259	12,454
Nov	18,127	18,280	17,616	16,327	18,370	13,700
Dec	18,104	20,280	16,782	16,696	18,845	13,675
Jan	18,708	20,280	17,704	18,127	19,962	15,991
Feb	18,827	20,280	17,330	18,051	17,176	17,800
Mar	19,049	20,280	17,948	19,814	20,179	19,219
Apr	20,143	20,280	18,993	19,829	20,451	18,413
May	20,217	20,280	19,246	19,489	20,930	17,920
Jun	19,510	20,280	18,585	18,922	20,335	16,040
Jul	18,990	20,280	17,955	18,014	19,600	14,118
Aug	18,598	19,600	17,497	16,814	18,714	11,965
Sep	18,733	18,900	18,289	15,707	17,866	11,573
Annual	18,935	20,280	16,782	17,721	20,930	11,573

[1] After removal of HH shutdowns.

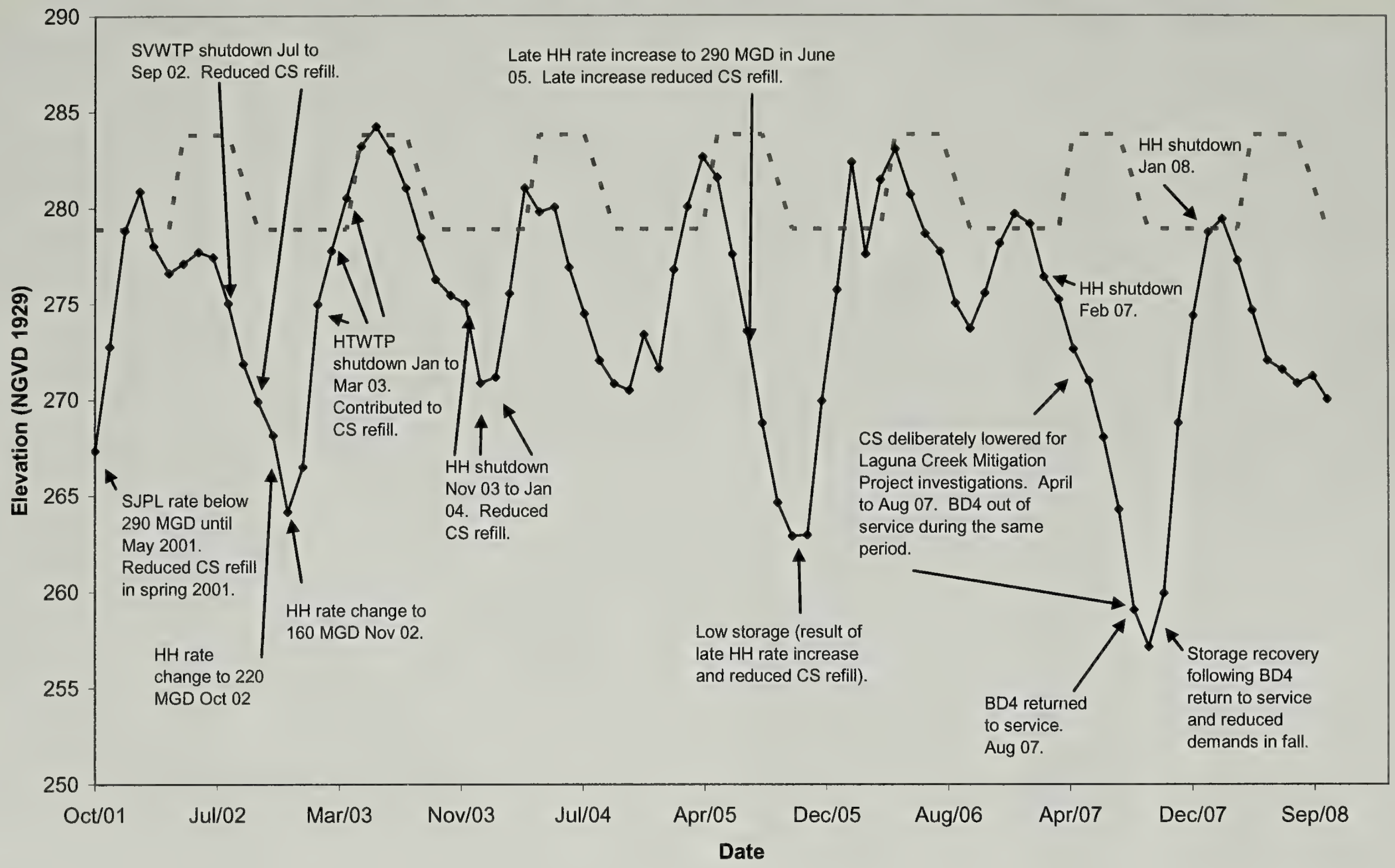
[2] Calculated from Scaling Factor

Table 5: Summary of Refined 2018 Restricted Crystal Springs Reservoir Elevations (ft NGVD 1929)

	Scaled 2018 Restricted CS Elev.		
	Avg	Max	Min
Oct	274.7	280.9	267.4
Nov	278.6	283.6	271.3
Dec	279.5	284.6	271.2
Jan	283.0	287.1	277.7
Feb	282.8	280.7	282.2
Mar	286.8	287.6	285.5
Apr	286.8	288.2	283.7
May	286.1	289.2	282.5
Jun	284.8	287.9	277.8
Jul	282.7	286.3	272.5
Aug	279.8	284.3	265.8
Sep	277.0	282.4	264.5
Annual	281.9	289.2	264.5

Water Supply & Treatment Division
Interoffice Memorandum

Figure 1. Crystal Springs Elevations: Observed Average Monthly Elevations for Water Years 2002 to 2008 (blue) and HH/LSM Base Setting Preferred Operating Elevations (red)



Attachment B: Adjusted HH/LSM Results, Method 1 - Monthly Scaling Methodology (SFPUC Method)

SUMMARY OF MODEL RUNS AND ANALYSES

Model Runs Compared:

File:	Steiner XL Doc: LCSDIP Variant (Steiner_01_25_09).xls
Run:	Baseline Condition (2005), Storage Modified with PUC Method Baseline 265mgd Existing Setting, CSR Max Op 283.8' w/ 2bg winter buffer
File:	Steiner XL Doc: LCSDIP Variant (Steiner_01_25_09).xls
Runs:	LCSDI Project, Storage Modified with PUC Method LCSDI Project net 265mgd, 10mgd R/C/GW, CSR Max Op 287.8' with 2bg winter buffer

Index (Methodology for Ranking of Water Years 1921-2002):

5 RESERVOIR INDEX
(Years sorted according to Aggregated Annual Inflow to 5 Alameda and Peninsula Reservoirs)

Summary of Tables & Charts Prepared from HH/LSM Output:

Table 1 - Avg Monthly Reservoir Storage Comparison by Hydrologic Year Type
Chart 1 - Reservoir Storage Comparison, Monthly Averages for All Years
Table 2 - Avg Monthly Reservoir Water Surface Elevations & Depths by Hydrologic Year Type
Chart 2 - Reservoir Water Surface Elevation & Depth Comparison, Monthly Average for All Years
Chart 3 - Water Surface Elevations for 82-year Hydrologic Record
Table 3 - Number/Percentage of Months Water Surface Equals or Exceeds a Given Elevation
Table 4 - All Monthly Data for 82-year Hydrologic Record & Delta Between Compared Model Runs

Table 1
Estimated Average Monthly Storage in UPPER/LOWER CRYSTAL SPRINGS RESERVOIR by Hydrologic Year Type (MG)
5 RESERVOIR INDEX (Years sorted according to Aggregated Annual Inflow to 5 Alameda and Peninsula Reservoirs)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept
Baseline Condition (2005), Storage Modified with PUC Method												
All	13,298	14,280	15,049	16,501	16,511	17,063	16,859	16,391	15,694	14,847	13,791	13,317
Wet	13,317	14,304	15,321	17,374	17,753	18,373	17,873	17,434	16,274	14,921	13,665	13,387
Above Normal	13,149	14,204	15,001	16,926	17,314	17,668	17,652	17,124	16,032	14,745	13,594	13,359
Normal	13,386	14,321	15,131	16,519	16,481	17,035	17,040	16,582	15,817	14,783	13,709	13,262
Below Normal	13,288	14,241	14,894	15,798	15,504	16,284	15,920	15,376	14,948	14,553	13,679	13,077
Dry	13,361	14,338	14,913	15,907	15,518	15,965	15,818	15,458	15,424	15,256	14,329	13,512
LCSDI Project, Storage Modified with PUC Method												
All	14,935	16,319	16,671	18,147	18,074	19,811	19,740	19,408	18,925	18,041	16,738	15,735
Wet	14,959	16,359	16,809	19,053	19,299	20,327	19,844	19,440	18,628	17,673	16,388	15,723
Above Normal	14,925	16,308	16,747	18,505	18,810	19,961	19,838	19,443	18,766	17,773	16,457	15,629
Normal	14,935	16,263	16,763	18,077	17,712	19,755	19,855	19,468	19,005	18,056	16,711	15,662
Below Normal	14,910	16,355	16,693	17,624	17,396	19,667	19,718	19,402	19,111	18,214	16,941	15,802
Dry	14,950	16,312	16,334	17,485	17,147	19,344	19,441	19,286	19,112	18,492	17,200	15,864
Percent Change, Baseline vs LCSDI Project												
All	12%	14%	11%	10%	9%	16%	17%	18%	21%	22%	21%	18%
Wet	12%	14%	10%	10%	9%	11%	11%	12%	14%	18%	20%	17%
Above Normal	14%	15%	12%	9%	9%	13%	12%	14%	17%	21%	21%	17%
Normal	12%	14%	11%	9%	7%	16%	17%	17%	20%	22%	22%	18%
Below Normal	12%	15%	12%	12%	12%	21%	24%	26%	28%	25%	24%	21%
Dry	12%	14%	10%	10%	11%	21%	23%	25%	24%	21%	20%	17%

CHART 1 - Reservoir Storage Volume, Monthly Averages for All Years
UPPER/LOWER CRYSTAL SPRINGS RESERVOIR

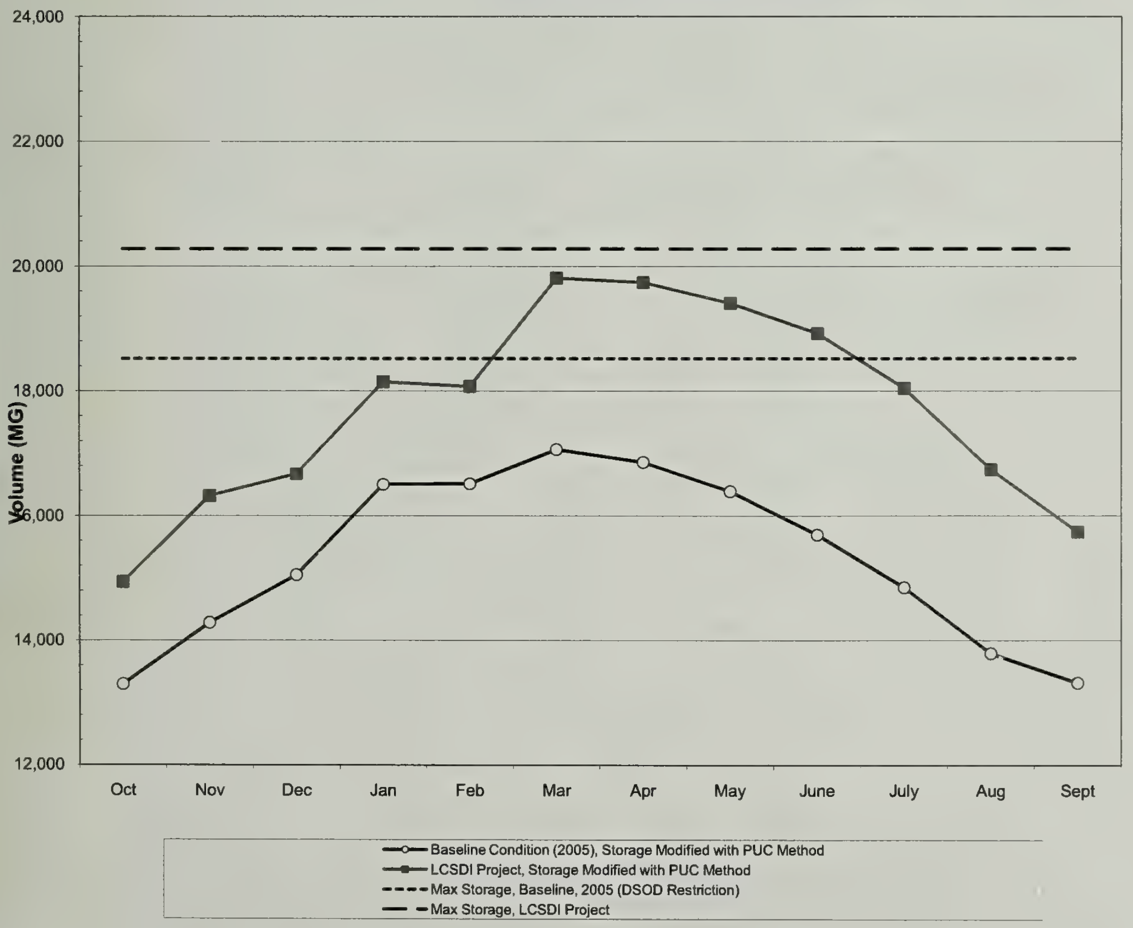


Table 2
Estimated Average Monthly Reservoir Water Surface Elevation in U/L CRYSTAL SPRINGS by Hydrologic Year Type (FT, NGVD-29)
5 RESERVOIR INDEX (Years sorted according to Aggregated Annual Inflow to 5 Alameda and Peninsula Reservoirs)

Baseline Condition (2005), Storage Modified with PUC Method	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept
All	270	272	275	278	278	280	279	278	276	274	271	270
Wet	270	272	275	281	282	283	282	281	278	274	271	270
Above Normal	269	272	274	279	281	282	282	280	277	274	270	270
Normal	270	272	275	278	278	280	280	279	277	274	271	269
Below Normal	270	272	274	277	276	278	277	275	274	273	271	269
Dry	270	273	274	277	276	277	277	276	276	275	273	270

LCSDI Project, Storage Modified with PUC Method	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept
All	274	278	279	283	283	287	287	286	285	283	279	276
Wet	274	278	279	285	286	288	287	286	284	282	278	276
Above Normal	274	278	279	284	284	287	287	286	284	282	278	276
Normal	274	278	279	283	282	287	287	286	285	283	279	276
Below Normal	274	278	279	282	281	286	287	286	285	283	279	277
Dry	274	278	278	281	280	286	286	286	285	284	281	277

Delta, Baseline vs LCSDI Project	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept
All	4	6	4	5	5	7	8	8	9	9	8	6
Wet	4	6	4	4	4	5	5	5	6	8	7	6
Above Normal	5	6	5	5	4	5	5	6	7	8	8	6
Normal	4	6	4	5	4	7	7	7	8	9	8	7
Below Normal	4	6	5	5	5	8	10	11	11	10	8	8
Dry	4	5	4	4	4	9	9	10	9	9	8	7

CHART 2 - Reservoir Water Surface Elevations and Depth, Monthly Average for All Years
U/L CRYSTAL SPRINGS RESERVOIR

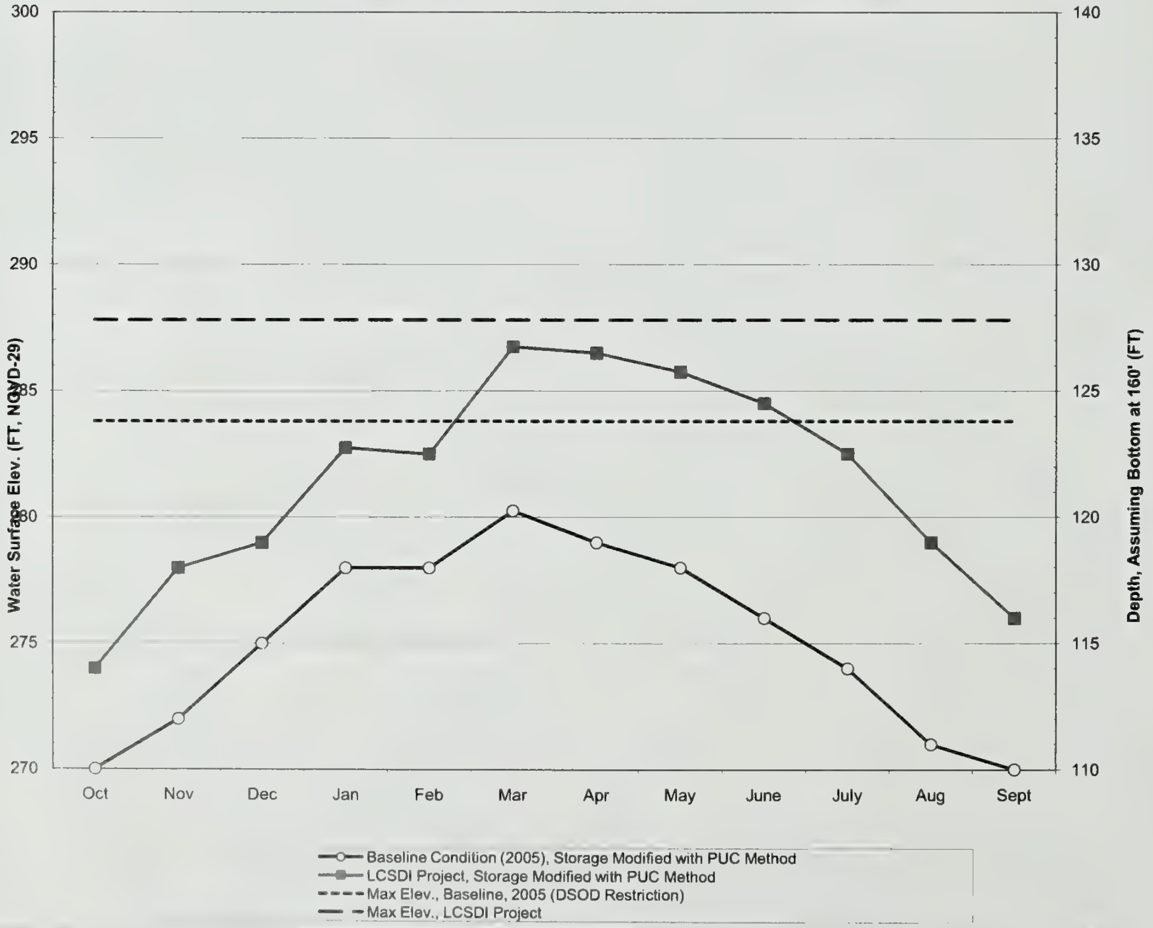
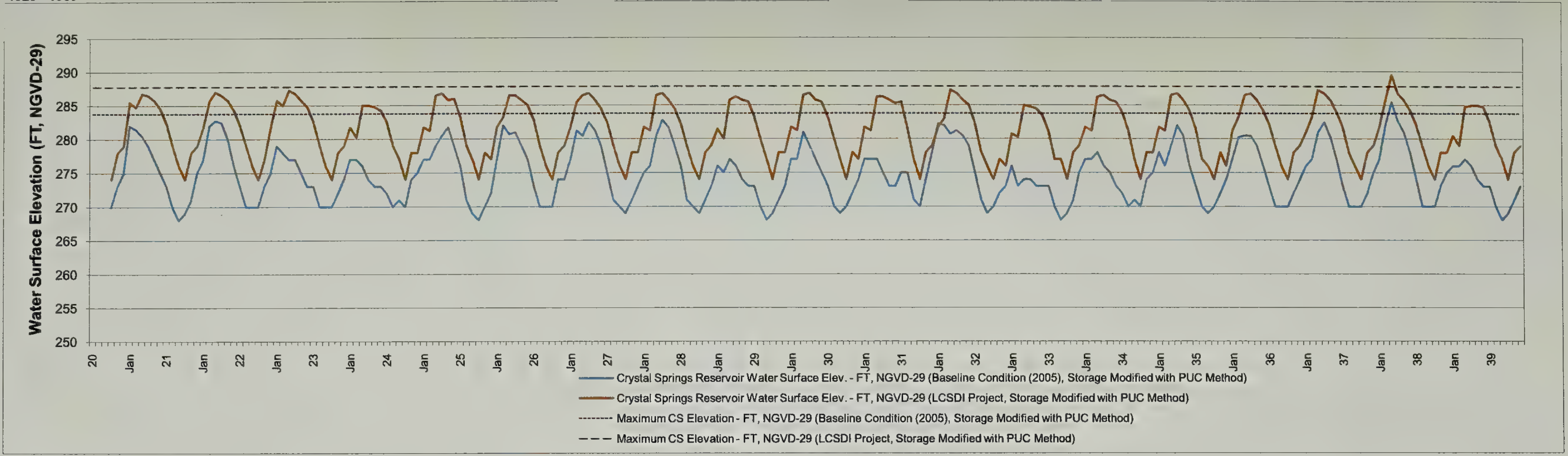


CHART 3 CRYSTAL SPRINGS WATER SURFACE ELEVATIONS

1920 - 1939



1940 - 1959

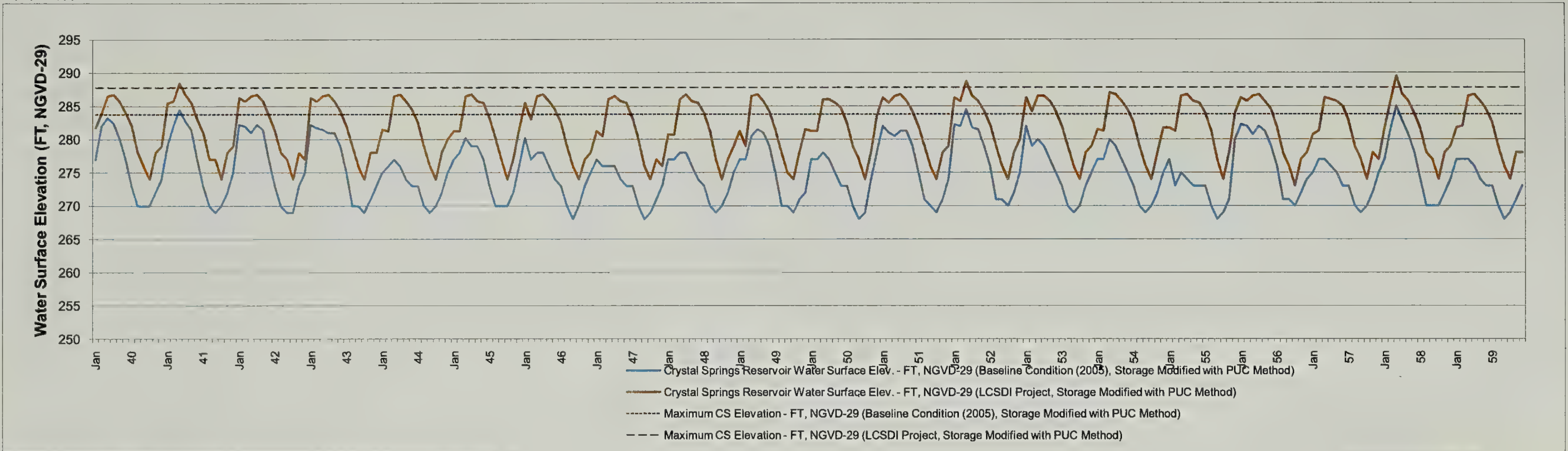
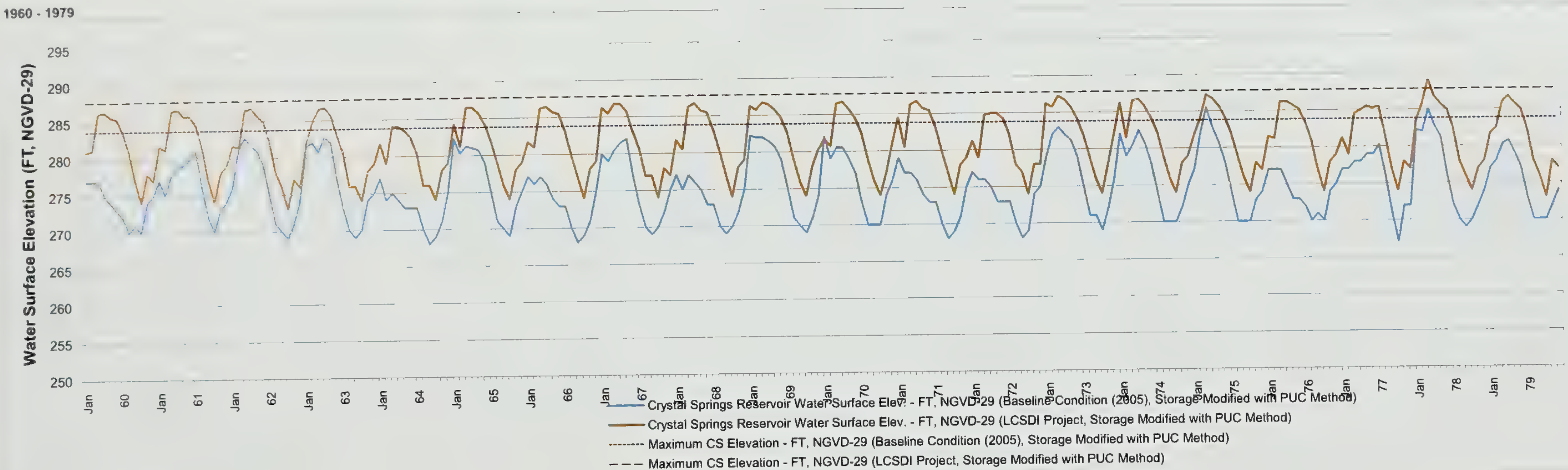


CHART 3 CRYSTAL SPRINGS WATER SURFACE ELEVATIONS



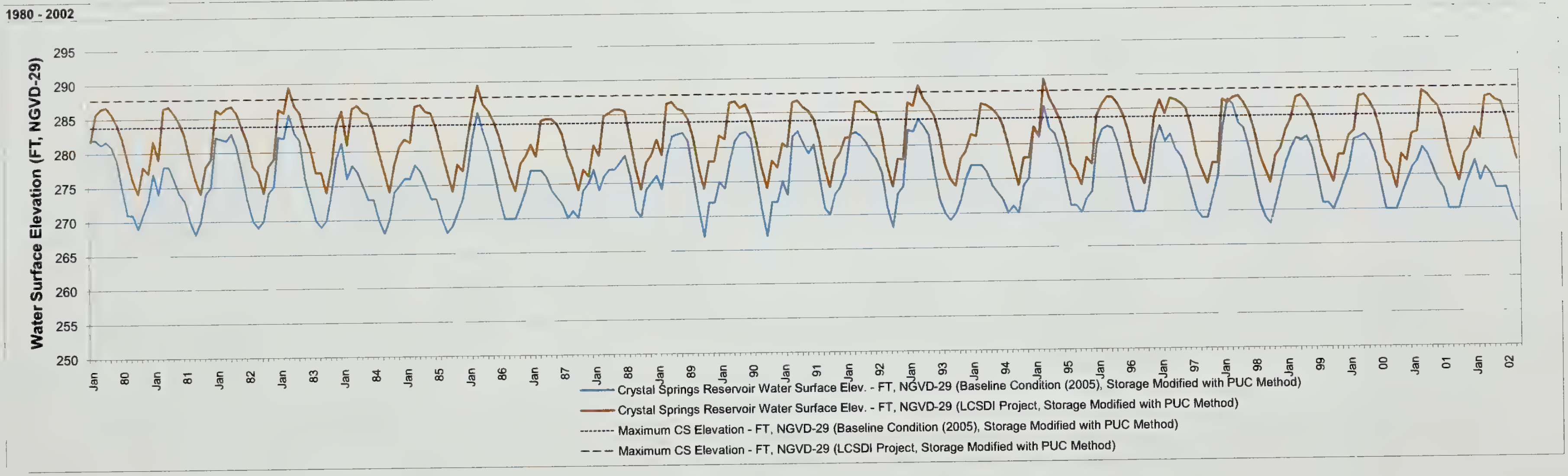


TABLE 3 - FREQUENCY OF INUNDATION

Number/Percentage of Months Water Surface in UPPER/LOWER CRYSTAL SPRINGS RESERVOIR Exceeds an Ele

	Number		Percentage	
Water Surface Elevation (FT, NGVD-29)	Baseline Condition (2005), Storage Modified with PUC Method	LCSDI Project, Storage Modified with PUC Method	Baseline Condition (2005), Storage Modified with PUC Method	LCSDI Project, Storage Modified with PUC Method
292.0	0	0	0.0%	0.0%
291.5	0	0	0.0%	0.0%
291.0	0	0	0.0%	0.0%
290.5	0	0	0.0%	0.0%
290.0	0	0	0.0%	0.0%
289.5	0	0	0.0%	0.0%
289.0	0	5	0.0%	0.5%
288.5	0	8	0.0%	0.8%
288.0	0	9	0.0%	0.9%
287.5	0	9	0.0%	0.9%
287.0	0	15	0.0%	1.5%
286.5	0	75	0.0%	7.6%
286.0	1	155	0.1%	15.8%
285.5	1	258	0.1%	26.2%
285.0	7	292	0.7%	29.7%
284.5	9	322	0.9%	32.7%
284.0	11	367	1.1%	37.3%
283.5	12	384	1.2%	39.0%
283.0	13	407	1.3%	41.4%
282.5	28	417	2.8%	42.4%
282.0	54	444	5.5%	45.1%
281.5	100	495	10.2%	50.3%
281.0	128	554	13.0%	56.3%
280.5	157	575	16.0%	58.4%
280	188	591	19.1%	60.1%
279	198	603	20.1%	61.3%
278	247	677	25.1%	68.8%
277	276	778	28.0%	79.1%
276	370	850	37.6%	86.4%
275	431	900	43.8%	91.5%
274	509	902	51.7%	91.7%
273	578	980	58.7%	99.6%
272	681	984	69.2%	100.0%
271	726	984	73.8%	100.0%
270	780	984	79.3%	100.0%
269	916	984	93.1%	100.0%
268	961	984	97.7%	100.0%
267	981	984	99.7%	100.0%
266	984	984	100.0%	100.0%
265	984	984	100.0%	100.0%
Total Months	984	984		

TABLE 4 - U/L CRYSTAL SPRINGS WATER SURFACE ELEVATIONS

Matrix Data for Water Year 1921-2002 Rank Ordered by Descending 5 RESERVOIR INDEX (Aggregated Annual Inflow to 5 Bay Area Reservoirs)

Crystal Springs Reservoir Water Surface Elevation (FT, NGVD-29)

Baseline Condition (2005)

Yr Type	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
W	1983	270.0	274.0	275.0	282.3	282.0	285.5	282.8	281.8	276.0	273.0	270	269
W	1998	269.0	272.0	275.0	282.3	286.3	285.5	282.8	282.0	279.0	275.0	271	269
W	1958	270.0	272.0	275.0	277.0	281.5	285.0	282.8	280.8	278.0	274.0	270	270
W	1941	270.0	272.0	274.0	279.0	282.0	284.5	282.8	281.5	277.0	273.0	270	269
W	1982	270.0	274.0	275.0	282.3	282.0	281.8	282.8	280.8	277.0	273.0	270	269
W	1995	270.0	274.0	275.0	282.3	281.0	285.5	282.3	281.5	279.0	275.0	271	271
W	1956	269.0	271.0	280.0	282.3	282.0	280.8	282.0	281.3	279.0	276.0	271	271
W	1952	269.0	271.0	274.0	282.3	282.0	284.5	281.8	281.5	279.0	276.0	271	271
W	1938	270.0	272.0	275.0	277.0	282.0	285.5	282.8	281.0	278.0	274.0	270	270
W	1997	270.0	274.0	280.0	282.5	280.3	281.3	279.0	278.0	276.0	273.0	270	269
W	1969	270.0	272.0	275.0	282.3	282.0	282.0	281.5	280.8	279.0	275.0	271	270
W	1973	269.0	274.0	275.0	279.0	282.0	283.0	282.0	281.3	279.0	275.0	271	271
W	1986	269.0	271.0	273.0	277.0	282.0	285.5	282.8	280.3	277.0	273.0	270	270
W	1980	270.0	272.0	274.0	282.0	282.0	281.3	281.8	281.0	279.0	275.0	271	271
W	1942	270.0	272.0	275.0	282.3	282.0	281.0	282.3	281.5	277.0	273.0	270	269
W	1967	269.0	271.0	275.0	280.0	279.0	280.5	281.5	282.0	277.0	273.0	270	269
AN	1963	269.0	271.0	274.0	281.5	282.0	280.8	282.8	282.0	277.0	273.0	270	269
AN	1940	269.0	271.0	273.0	277.0	282.0	283.3	282.5	280.3	277.0	273.0	270	270
AN	1965	269.0	271.0	275.0	282.3	280.3	281.3	281.0	280.8	279.0	275.0	271	270
AN	1996	270.0	272.0	273.0	280.0	282.0	282.5	282.3	280.0	277.0	273.0	270	270
AN	1922	269.0	271.0	275.0	277.0	282.0	282.8	282.5	280.0	276.0	273.0	270	270
AN	1975	270.0	272.0	275.0	277.0	282.0	285.5	282.8	280.8	278.0	274.0	270	270
AN	1974	269.0	272.0	276.0	282.0	279.0	280.5	282.5	280.8	278.0	274.0	270	270
AN	1978	267.0	272.0	272.0	282.3	282.0	285.0	282.8	281.3	276.0	272.0	270	269
AN	1993	268.0	273.0	274.0	282.3	282.0	283.8	282.8	281.5	276.0	272.0	270	269
AN	1951	269.0	274.0	278.0	282.0	281.0	280.5	281.3	281.3	279.0	275.0	271	270
AN	1943	269.0	273.0	275.0	282.3	281.8	281.5	281.0	281.0	279.0	275.0	270	270
AN	1927	270.0	274.0	274.0	277.0	281.3	280.5	282.5	281.3	279.0	275.0	271	270
AN	1937	270.0	272.0	274.0	276.0	277.0	281.0	282.5	280.3	277.0	273.0	270	270
AN	2000	270.0	272.0	274.0	276.0	280.3	280.5	281.0	280.0	278.0	274.0	270	270
AN	1921	270.0	273.0	275.0	282.0	281.5	280.5	279.0	277.0	275.0	273.0	270	268
AN	1999	268.0	271.0	274.0	277.0	279.0	280.5	280.3	280.8	279.0	275.0	271	271
AN	1923	270.0	273.0	275.0	279.0	278.0	277.0	277.0	275.0	273.0	273.0	270	270
N	1953	270.0	272.0	275.0	282.0	279.0	280.0	279.0	277.0	275.0	273.0	270	269
N	1928	269.0	271.0	273.0	275.0	276.0	280.5	282.8	281.8	279.0	276.0	271	270
N	1970	269.0	271.0	274.0	282.0	279.0	280.5	280.5	279.0	277.0	273.0	270	270
N	1984	270.0	274.0	279.0	281.3	276.0	278.0	277.0	275.0	273.0	273.0	270	268
N	1946	270.0	272.0	276.0	280.3	277.0	278.0	278.0	276.0	274.0	273.0	270	268
N	1926	268.0	270.0	272.0	277.0	282.0	280.8	281.0	279.0	277.0	273.0	270	270
N	1936	270.0	272.0	274.0	277.0	280.3	280.5	280.5	279.0	276.0	273.0	270	270
N	1945	270.0	272.0	275.0	277.0	278.0	280.3	279.0	279.0	277.0	273.0	270	270
N	1971	270.0	274.0	276.0	279.0	277.0	277.0	276.0	274.0	273.0	273.0	270	268
N	1935	270.0	274.0	275.0	278.0	276.0	279.0	282.0	280.5	276.0	273.0	270	269
N	1932	270.0	274.0	278.0	282.3	282.0	280.8	281.3	280.5	279.0	275.0	271	269
N	1979	270.0	272.0	274.0	277.0	278.0	280.3	280.8	279.0	277.0	273.0	270	270
N	1962	270.0	273.0	274.0	276.0	281.3	282.8	281.8	281.0	279.0	275.0	271	270
N	1949	270.0	272.0	275.0	277.0	277.0	280.5	281.5	281.0	279.0	275.0	270	270
N	1992	270.0	273.0	274.0	276.0	281.8	282.0	281.5	280.5	279.0	278.0	276	271
N	1981	269.0	271.0	273.0	277.0	274.0	278.0	278.0	276.0	274.0	273.0	270	268
BN	2001	270.0	272.0	274.0	276.0	277.0	279.0	278.0	276.0	274.0	273.0	270	270
BN	1930	269.0	271.0	273.0	277.0	277.0	281.0	279.0	277.0	275.0	273.0	270	269
BN	1954	270.0	273.0	275.0	277.0	277.0	280.0	279.0	277.0	275.0	273.0	270	269
BN	1968	270.0	272.0	275.0	277.0	275.0	277.0	276.0	275.0	273.0	273.0	270	269
BN	1959	270.0	272.0	274.0	277.0	277.0	277.0	276.0	274.0	273.0	273.0	270	268
BN	1925	270.0	274.0	275.0	277.0	277.0	279.0	280.5	281.8	279.0	276.0	271	269
BN	1944	269.0	271.0	273.0	275.0	276.0	277.0	276.0	274.0	273.0	273.0	270	269
BN	2002	270.0	273.0	275.0	277.0	274.0	276.0	275.0	273.0	273.0	273.0	270	268
BN	1950	269.0	271.0	272.0	277.0	277.0	278.0	277.0	275.0	273.0	273.0	270	268
BN	1966	269.0	273.0	275.0	277.0	276.0	277.0	276.0	274.0	273.0	273.0	270	268
BN	1955	270.0	272.0	275.0	277.0	273.0	275.0	274.0	273.0	273.0	273.0	270	268
BN	1957	270.0	272.0	274.0	275.0	277.0	277.0	276.0	275.0	273.0	273.0	270	269
BN	1934	269.0	271.0	275.0	277.0	277.0	278.0	276.0	275.0	273.0	272.0	270	271
BN	1985	270.0	274.0	275.0	276.0	276.0	278.0	277.0	275.0	273.0	273.0	270	268
BN	1991	267.0	272.0	272.0	275.0	273.0	281.5	282.3	280.5	279.0	280.3	276	271
BN	1929	269.0	271.0	273.0	276.0	275.0	277.0	276.0	274.0	273.0	273.0	270	268
BN	1964	270.0	274.0	275.0	277.0	274.0	275.0	274.0	273.0	273.0	273.0	270	268
D	1947	270.0	273.0	275.0	277.0	276.0	276.0	276.0	274.0	273.0	273.0	270	268
D	1994	270.0	272.0	275.0	277.0	277.0	277.0	276.0	274.0	273.0	272.0	270	271
D	1939	270.0	273.0	275.0	276.0	276.0	277.0	276.0	274.0	273.0	273.0	270	268
D	1948	269.0	271.0	273.0	277.0	277.0	278.0	278.0	276.0	274.0	273.0	270	269
D	1960	269.0	271.0	273.0	277.0	277.0	277.0	275.0	274.0	273.0	272.0	270	271
D	1972	269.0	271.0	275.0	277.0	276.0	276.0	275.0	273.0	273.0	273.0	270	268
D	1933	270.0	272.0	273.0	276.0	273.0	274.0	274.0	273.0	273.0	273.0	270	268
D	1961	270.0	274.0	275.0	277.0	275.0	278.0	279.0	279.0	280.0	281.0	276	272
D	1990	267.0	272.0	272.0	275.0	274.0	278.0	281.0	282.0	282.3	281.3	276	271
D	1987	270.0	272.0	274.0	277.0	277.0	277.0	276.0	274.0	273.0	272.0	270	271
D	1988	270.0	274.0	275.0	277.0	274.0	276.0	277.0	277.0	278.0	279.0	276	271
D	1989	270.0	274.0	275.0	276.0	274.0	279.0	281.8	282.0	282.3	281.0	276	271
D	1931	270.0	272.0	274.0	277.0	277.0	277.0	275.0	273.0	273.0	275.0	275	271
D	1976	270.0	273.0	274.0	277.0	277.0	277.0	275.0	273.0	273.0	272.0	270	271
D	1977	270.0	274.0	275.0	277.0	277.0	278.0	278.0	279.0	279.0	280.3	276	271
D	1924	270.0	272.0	274.0	277.0	277.0	276.0	274.0	273.0	273.0	272.0	270	271

TABLE 4 - U/L CRYSTAL SPRINGS WATER SURFACE ELEVATIONS

Matrix Data for Water Year 1921-2002 Rank Ordered by Descending 5 RESERVOIR INDEX (Aggregated Annual Inflow to 5 Bay Area Reservoirs)
Crystal Springs Reservoir Water Surface Elevation (FT, NGVD-29)
LCSDI Project

Yr Type	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
W	1983	274	278	279	286	286	290	287	286	283	281	277	277
W	1998	274	277	277	286	286	287	287	286	284	282	278	276
W	1958	274	278	277	282	286	290	287	286	284	282	278	277
W	1941	274	278	279	286	286	289	287	286	283	281	277	277
W	1982	274	278	279	286	286	287	287	286	284	282	278	277
W	1995	274	278	278	283	281	290	287	285	284	281	277	276
W	1956	274	278	284	286	286	287	287	286	285	282	278	276
W	1952	274	278	279	286	286	289	287	286	284	282	279	276
W	1938	274	278	279	282	286	290	287	286	284	282	279	276
W	1997	274	278	284	286	284	287	286	286	285	282	278	276
W	1969	274	278	279	286	286	287	287	286	285	283	279	276
W	1973	274	278	278	286	286	287	287	286	284	282	279	276
W	1986	274	278	277	282	286	290	287	286	284	282	279	276
W	1980	273	278	277	282	286	287	287	286	284	282	279	276
W	1942	274	278	279	286	286	287	287	286	284	281	278	277
W	1967	274	278	279	286	286	287	287	286	283	281	277	277
AN	1963	273	277	276	282	285	287	287	286	283	281	276	276
AN	1940	274	278	279	282	284	287	287	286	284	282	278	276
AN	1965	274	278	279	284	281	287	287	286	284	282	279	276
AN	1996	274	278	277	284	286	287	287	286	284	282	278	276
AN	1922	274	278	279	282	286	287	287	286	284	282	279	276
AN	1975	274	278	279	282	284	287	287	286	284	282	279	276
AN	1974	274	278	282	286	282	287	287	286	284	282	279	276
AN	1978	274	278	277	284	286	289	287	286	285	283	278	276
AN	1993	274	278	278	286	286	289	287	286	284	282	277	275
AN	1951	274	278	284	286	286	287	287	286	284	282	279	276
AN	1943	274	278	277	286	286	287	287	286	284	282	279	276
AN	1927	274	278	279	282	286	287	287	286	285	283	279	276
AN	1937	274	278	279	281	283	287	287	286	284	282	278	276
AN	2000	274	278	278	281	282	287	287	286	284	282	277	276
AN	1921	274	278	279	286	285	287	287	286	285	282	279	276
AN	1999	274	278	279	282	283	287	287	286	284	282	278	276
AN	1923	274	277	282	286	285	287	287	286	285	283	279	276
N	1953	274	278	280	286	284	287	287	286	284	282	279	276
N	1928	274	278	278	282	281	287	287	286	285	282	279	276
N	1970	274	278	280	282	281	287	287	286	285	283	279	276
N	1984	274	278	284	286	281	286	287	286	286	283	280	277
N	1946	274	277	282	286	283	287	287	286	285	283	279	276
N	1926	274	278	277	282	283	287	287	286	285	283	279	276
N	1936	274	278	276	281	283	287	287	286	284	282	279	276
N	1945	274	278	280	281	281	287	287	286	286	283	280	277
N	1971	274	277	281	285	281	286	287	286	286	283	280	277
N	1935	274	278	278	282	281	287	287	286	284	282	277	276
N	1932	274	278	279	282	283	287	287	286	285	282	278	276
N	1979	274	277	278	282	283	286	287	286	285	282	278	276
N	1962	274	278	279	282	282	287	287	286	285	282	278	276
N	1949	274	277	279	281	279	287	287	286	284	282	278	275
N	1992	274	278	279	281	281	287	287	286	285	285	282	277
N	1981	274	278	277	282	279	287	287	286	285	283	279	276
BN	2001	273	278	277	281	281	287	287	286	285	283	279	276
BN	1930	274	278	278	282	281	287	287	286	286	283	280	277
BN	1954	274	278	279	282	281	287	287	286	285	283	279	276
BN	1968	274	278	277	282	281	286	287	286	286	283	280	277
BN	1959	274	278	279	282	282	287	287	286	285	283	279	276
BN	1925	274	278	278	282	281	287	287	286	286	283	279	277
BN	1944	274	278	278	282	281	287	287	286	285	283	279	276
BN	2002	274	278	279	282	280	286	287	286	286	283	280	277
BN	1950	274	278	282	281	281	286	286	286	285	283	279	277
BN	1966	274	278	279	282	281	286	287	286	286	283	280	277
BN	1955	274	278	282	282	281	287	287	286	286	284	281	277
BN	1957	273	277	278	281	281	286	286	286	285	283	279	277
BN	1934	274	278	279	282	281	286	287	286	286	284	281	277
BN	1985	274	278	281	282	281	287	287	286	286	283	280	277
BN	1991	274	278	277	281	280	287	287	286	285	284	281	277
BN	1929	274	278	279	282	280	286	286	286	286	283	280	277
BN	1964	274	278	279	282	279	284	284	284	283	280	276	276
D	1947	274	277	278	281	281	286	287	286	286	283	280	276
D	1994	274	278	279	282	281	286	286	285	285	283	280	277
D	1939	274	278	278	281	279	285	285	285	285	283	279	277
D	1948	274	277	276	281	281	286	287	286	286	284	281	277
D	1960	274	278	278	281	281	286	287	286	286	284	281	277
D	1972	274	278	279	281	279	285	285	285	284	282	278	277
D	1933	274	277	276	281	280	285	285	285	284	281	277	277
D	1961	274	278	277	282	281	287	287	286	286	285	282	277
D	1990	274	278	278	282	281	287	287	286	286	285	281	277
D	1987	274	278	279	281	279	284	285	285	284	282	279	277
D	1988	274	277	276	281	279	285	285	286	286	286	282	277
D	1989	274	278	279	281	279	287	287	286	286	284	282	277
D	1931	274	278	277	282	281	286	286	286	285	286	282	277
D	1976	274	278	277	282	281	286	286	286	285	284	281	277
D	1977	274	278	279	281	279	285	285	286	285	286	282	277
D	1924	274	278	279	282	280	285	285	285	284	283	279	277

TABLE 4 - U/L CRYSTAL SPRINGS WATER SURFACE ELEVATIONS

Matrix Data for Water Year 1921-2002 Rank Ordered by Descending 5 RESERVOIR INDEX (Aggregated Annual Inflow to 5 Bay Area Reservoirs)

Crystal Springs Reservoir Water Surface Elevation (FT, NGVD-29)

LCSDI Project minus
Baseline Condition (2005)

Yr Type	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
W	1983	4	4	4	4	4	4	4	4	7	8	7	8
W	1998	5	5	2	4	-1	1	4	4	5	7	7	7
W	1958	4	6	2	5	4	5	4	5	6	8	8	7
W	1941	4	6	5	7	4	4	4	4	6	8	7	8
W	1982	4	4	4	4	4	5	4	5	7	9	8	8
W	1995	4	4	3	0	0	4	5	4	5	6	6	5
W	1956	5	7	4	4	4	6	5	5	6	6	7	5
W	1952	5	7	5	4	4	4	5	4	5	6	8	5
W	1938	4	6	4	5	4	4	4	5	6	8	9	6
W	1997	4	4	4	4	4	5	7	8	9	9	8	7
W	1969	4	6	4	4	4	5	5	5	6	8	8	6
W	1973	5	4	3	7	4	4	5	5	5	7	8	5
W	1986	5	7	4	5	4	4	4	6	7	9	9	6
W	1980	3	6	3	0	4	5	5	5	5	7	8	5
W	1942	4	6	4	4	4	6	5	4	7	8	8	8
W	1967	5	7	4	6	7	6	5	4	6	8	7	8
AN	1963	4	6	2	1	3	6	4	4	6	8	6	7
AN	1940	5	7	6	5	2	3	4	6	7	9	8	6
AN	1965	5	7	4	2	1	5	6	5	5	7	8	6
AN	1996	4	6	4	4	4	4	5	6	7	9	8	6
AN	1922	5	7	4	5	4	4	4	6	8	9	9	6
AN	1975	4	6	4	5	2	2	4	5	6	8	9	6
AN	1974	5	6	6	4	3	6	4	5	6	8	9	6
AN	1978	7	6	5	1	4	4	4	5	9	11	8	7
AN	1993	6	5	4	4	4	5	4	4	8	10	7	6
AN	1951	5	4	6	4	5	6	6	5	5	7	8	6
AN	1943	5	5	2	4	4	5	6	5	5	7	9	6
AN	1927	4	4	5	5	4	6	4	5	6	8	8	6
AN	1937	4	6	5	5	6	6	4	6	7	9	8	6
AN	2000	4	6	4	5	1	6	6	6	6	8	7	6
AN	1921	4	5	4	4	3	6	8	9	10	9	9	8
AN	1999	6	7	5	5	4	6	7	5	5	7	7	5
AN	1923	4	4	7	7	7	10	10	11	12	10	9	6
N	1953	4	6	5	4	5	7	8	9	9	9	9	7
N	1928	5	7	5	7	5	6	4	4	6	6	8	6
N	1970	5	7	6	0	2	6	6	7	8	10	9	6
N	1984	4	4	5	5	5	8	10	11	13	10	10	9
N	1946	4	5	6	5	6	9	9	10	11	10	9	8
N	1926	6	8	5	5	1	6	6	7	8	10	9	6
N	1936	4	6	2	4	3	6	6	7	8	9	9	6
N	1945	4	6	5	4	3	6	8	7	9	10	10	7
N	1971	4	3	5	6	4	9	11	12	13	10	10	9
N	1935	4	4	3	4	5	8	5	5	8	9	7	7
N	1932	4	4	1	-1	1	7	6	5	6	7	7	7
N	1979	4	5	4	5	5	6	6	7	8	9	8	6
N	1962	4	5	5	6	0	4	5	5	6	7	7	6
N	1949	4	5	4	4	2	6	5	5	5	7	8	5
N	1992	4	5	5	5	-1	5	5	5	6	7	6	6
N	1981	5	7	4	5	5	9	9	10	11	10	9	8
BN	2001	3	6	3	5	4	8	9	10	11	10	9	6
BN	1930	5	7	5	5	4	6	8	9	11	10	10	8
BN	1954	4	5	4	5	4	7	8	9	10	10	9	7
BN	1968	4	6	2	5	6	9	11	11	13	10	10	8
BN	1959	4	6	5	5	5	10	11	12	12	10	9	8
BN	1925	4	4	3	5	4	8	6	4	7	7	8	8
BN	1944	5	7	5	7	5	10	11	12	12	10	9	7
BN	2002	4	5	4	5	6	10	12	13	13	10	10	9
BN	1950	5	7	10	4	4	8	9	11	12	10	9	9
BN	1966	5	5	4	5	5	9	11	12	13	10	10	9
BN	1955	4	6	7	5	8	12	13	13	13	11	11	9
BN	1957	3	5	4	6	4	9	10	11	12	10	9	8
BN	1934	5	7	4	5	4	8	11	11	13	12	11	6
BN	1985	4	4	6	6	5	9	10	11	13	10	10	9
BN	1991	7	6	5	6	7	5	5	5	6	4	5	6
BN	1929	5	7	6	6	5	9	10	12	13	10	10	9
BN	1964	4	4	4	5	5	9	10	11	10	7	6	8
D	1947	4	4	3	4	5	10	11	12	13	10	10	8
D	1994	4	6	4	5	4	9	10	11	12	11	10	6
D	1939	4	5	3	5	3	8	9	11	12	10	9	9
D	1948	5	6	3	4	4	8	9	10	12	11	11	8
D	1960	5	7	5	4	4	9	12	12	13	12	11	6
D	1972	5	7	4	4	3	9	10	12	11	9	8	9
D	1933	4	5	3	5	7	11	11	12	11	8	7	9
D	1961	4	4	2	5	6	9	8	7	6	4	6	5
D	1990	7	6	6	7	7	9	6	4	4	3	5	6
D	1987	4	6	5	4	2	7	9	11	11	10	9	6
D	1988	4	3	1	4	5	9	8	9	8	7	6	6
D	1989	4	4	4	5	5	8	5	4	3	3	6	6
D	1931	4	6	3	5	4	9	11	13	12	11	7	6
D	1976	4	5	3	5	4	9	11	13	12	12	11	6
D	1977	4	4	4	4	2	7	7	7	6	5	6	6
D	1924	4	6	5	5	3	9	11	12	11	11	9	6

SUMMARY OF MODEL RUNS AND ANALYSES

Model Runs Compared:

File: Steiner XL Doc: LCSDIP Variant (Steiner_01_25_09).xls
Run: Baseline Condition (2005), Storage Modified with Year Type Method
Baseline
265mgd Existing Setting, CSR Max Op 283.8' w/ 2bg winter buffer

File: Steiner XL Doc: LCSDIP Variant (Steiner_01_25_09).xls
Runs: LCSDI Project, Storage Modified with Year Type Method
LCSDI Project
net 265mgd, 10mgd R/C/GW, CSR Max Op 287.8' with 2bg winter buffer

Index (Methodology for Ranking of Water Years 1921-2002):

5 RESERVOIR INDEX
(Years sorted according to Aggregated Annual Inflow to 5 Alameda and Peninsula Reservoirs)

Summary of Tables & Charts Prepared from HH/LSM Output:

Table 1 - Avg Monthly Reservoir Storage Comparison by Hydrologic Year Type
Chart 1 - Reservoir Storage Comparison, Monthly Averages for All Years
Table 2 - Avg Monthly Reservoir Water Surface Elevations & Depths by Hydrologic Year Type
Chart 2 - Reservoir Water Surface Elevation & Depth Comparison, Monthly Average for All Years
Chart 3 - Water Surface Elevations for 82-year Hydrologic Record
Table 3 - Number/Percentage of Months Water Surface Equals or Exceeds a Given Elevation
Table 4 - All Monthly Data for 82-year Hydrologic Record & Delta Between Compared Model Runs

Table 1
Estimated Average Monthly Storage in UPPER/LOWER CRYSTAL SPRINGS RESERVOIR by Hydrologic Year Type (MG)
5 RESERVOIR INDEX (Years sorted according to Aggregated Annual Inflow to 5 Alameda and Peninsula Reservoirs)

Baseline Condition (2005), Storage Modified with Year Type Method

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept
All	13,923	14,858	16,610	16,596	16,980	17,541	16,896	16,162	15,235	13,998	13,087	12,842
Wet	13,718	14,637	16,708	17,311	17,585	19,792	18,046	16,674	15,676	14,466	13,332	13,224
Above Normal	13,545	14,534	16,359	16,865	17,150	19,033	17,823	16,377	15,442	14,295	13,262	13,196
Normal	13,198	12,138	14,868	15,775	17,213	17,191	17,026	16,563	16,012	15,260	14,794	14,223
Below Normal	12,999	15,848	17,644	16,673	17,141	16,689	17,092	17,563	16,416	15,068	14,036	13,795
Dry	16,237	17,088	17,424	16,334	15,792	14,959	14,422	13,531	12,545	10,817	9,942	9,690

LCSDI Project, Storage Modified with Year Type Method

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept
All	15,636	16,982	18,401	18,254	18,595	20,336	19,781	19,166	18,387	17,020	15,899	15,184
Wet	15,410	16,739	18,331	18,984	19,117	21,897	20,037	18,592	17,943	17,134	15,988	15,531
Above Normal	15,375	16,687	18,263	18,439	18,632	21,503	20,030	18,595	18,075	17,231	16,055	15,438
Normal	14,725	13,785	16,473	17,263	18,499	19,936	19,839	19,446	19,239	18,639	18,034	16,796
Below Normal	14,585	18,200	19,776	18,600	19,234	20,157	21,170	22,162	20,988	18,858	17,383	16,670
Dry	18,170	19,440	19,085	17,954	17,450	18,126	17,726	16,882	15,545	13,111	11,934	11,377

Percent Change, Baseline vs LCSDI Project

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept
All	12%	14%	11%	10%	10%	16%	17%	19%	21%	22%	21%	18%
Wet	12%	14%	10%	10%	9%	11%	11%	12%	14%	18%	20%	17%
Above Normal	14%	15%	12%	9%	9%	13%	12%	14%	17%	21%	21%	17%
Normal	12%	14%	11%	9%	7%	16%	17%	17%	20%	22%	22%	18%
Below Normal	12%	15%	12%	12%	12%	21%	24%	26%	28%	25%	24%	21%
Dry	12%	14%	10%	10%	11%	21%	23%	25%	24%	21%	20%	17%

CHART 1 - Reservoir Storage Volume, Monthly Averages for All Years
UPPER/LOWER CRYSTAL SPRINGS RESERVOIR

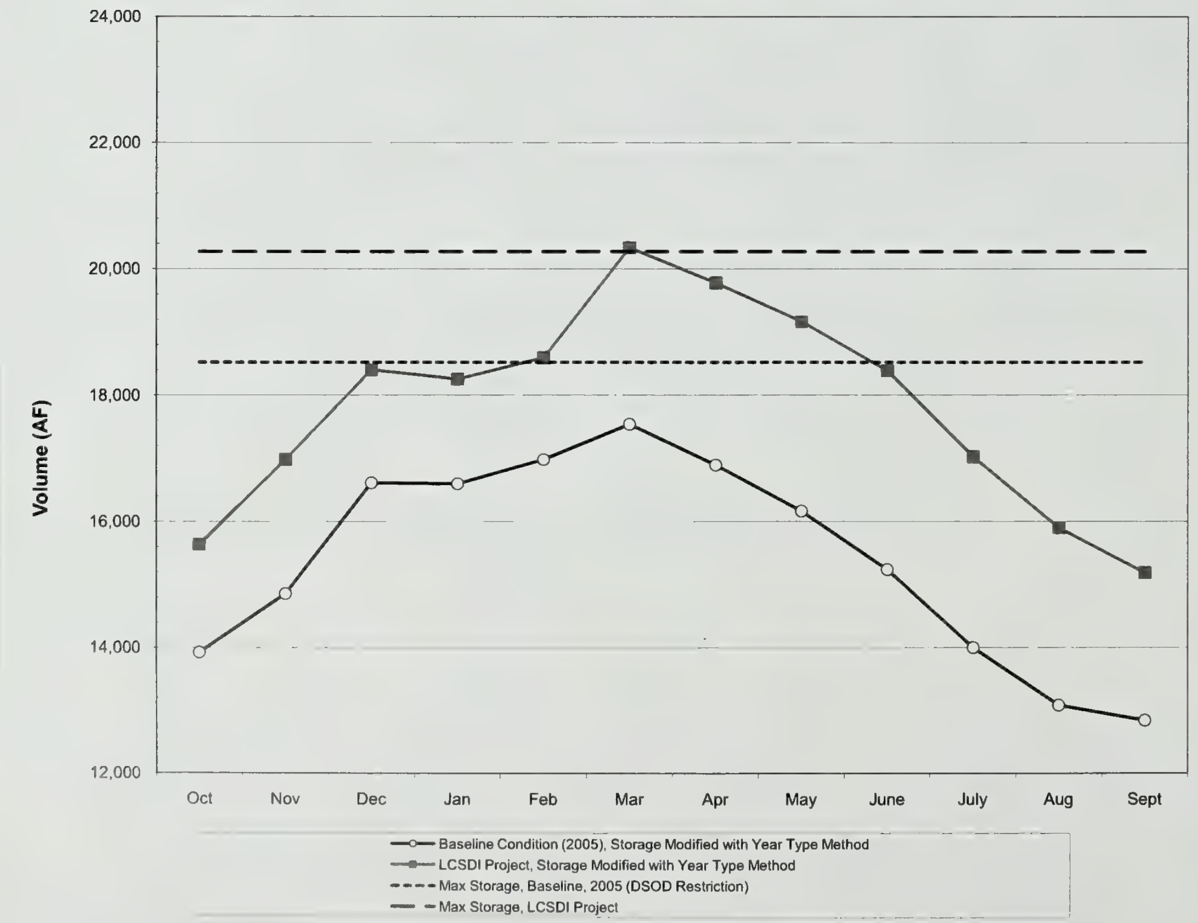


Table 2
Estimated Average Monthly Reservoir Water Surface Elevation in U/L CRYSTAL SPRINGS by Hydrologic Year Type (FT, NGVD-29)
5 RESERVOIR INDEX (Years sorted according to Aggregated Annual Inflow to 5 Alameda and Peninsula Reservoirs)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept
Baseline Condition (2005), Storage Modified with Year Type Method												
All	271	274	279	279	280	281	279	277	275	272	269	268
Wet	271	273	279	281	282	287	283	279	276	273	270	269
Above Normal	270	273	278	279	280	285	282	278	276	272	269	269
Normal	269	266	274	276	281	281	280	279	277	275	274	272
Below Normal	269	277	282	279	280	279	280	282	278	275	272	271
Dry	278	280	281	278	277	274	273	270	267	262	259	258
LCSDI Project, Storage Modified with Year Type Method												
All	276	280	284	283	284	288	287	285	283	280	277	275
Wet	275	279	283	285	285	292	287	284	282	280	277	276
Above Normal	275	279	283	284	284	290	287	284	283	281	277	276
Normal	274	271	278	281	284	287	287	286	285	284	283	279
Below Normal	273	283	287	284	285	288	290	292	289	285	281	279
Dry	283	286	285	282	281	283	282	279	276	269	265	264
Delta, Baseline vs LCSDI Project												
All	5	6	5	4	4	7	8	8	8	8	8	7
Wet	4	6	4	4	4	5	5	5	6	7	7	7
Above Normal	5	6	5	5	4	6	5	6	7	9	8	7
Normal	5	5	4	5	3	7	7	7	8	9	9	7
Below Normal	4	6	5	5	5	9	9	10	11	10	9	8
Dry	5	6	4	4	4	9	9	9	9	7	6	6

CHART 2 - Reservoir Water Surface Elevations and Depth, Monthly Average for All Years U/L CRYSTAL SPRINGS RESERVOIR

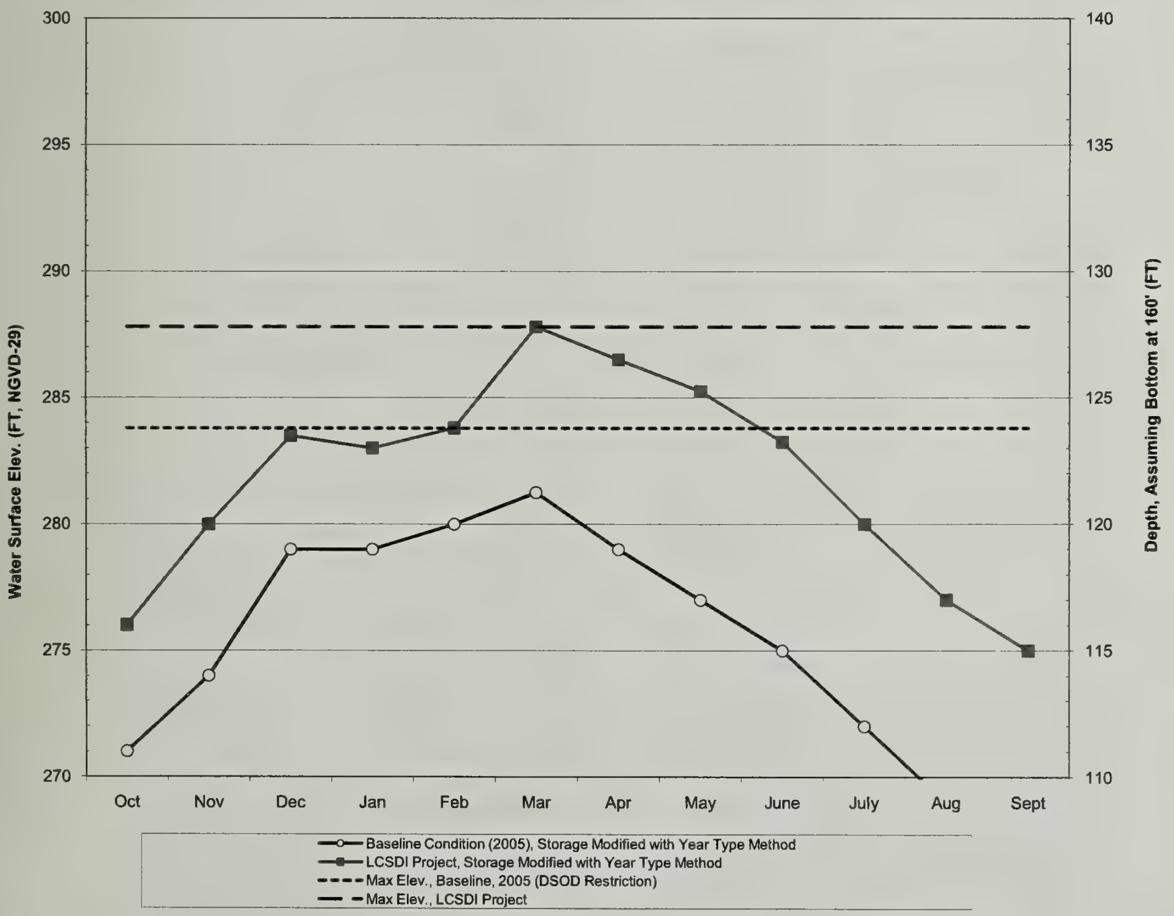
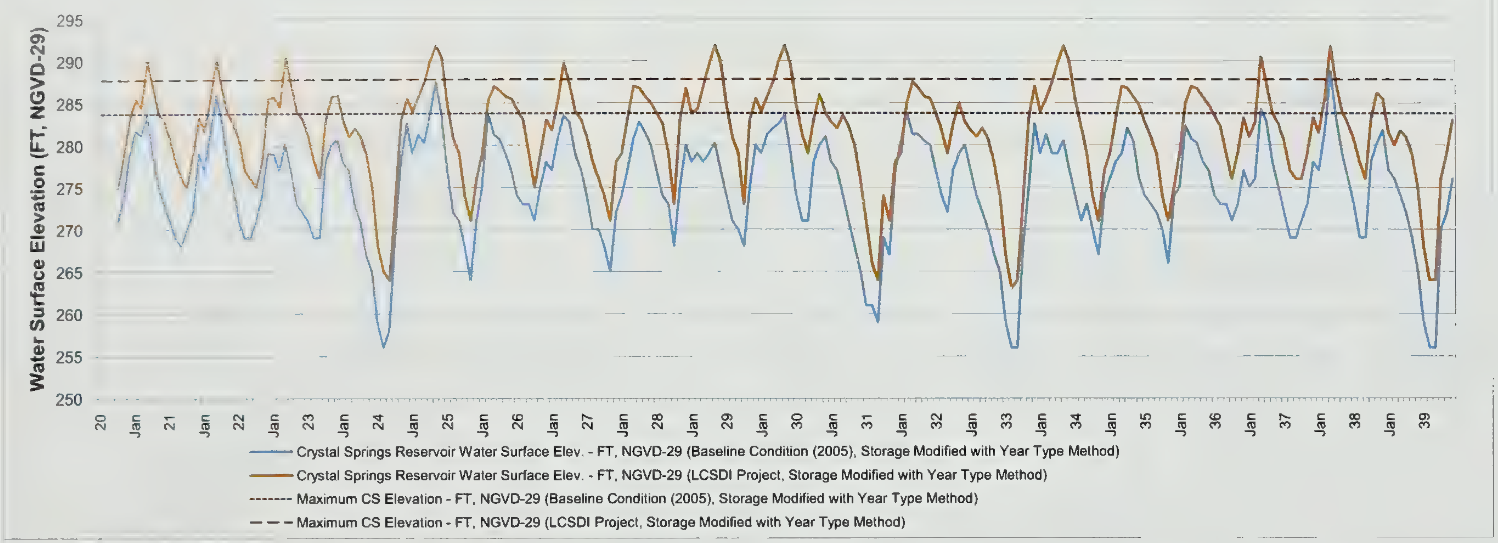
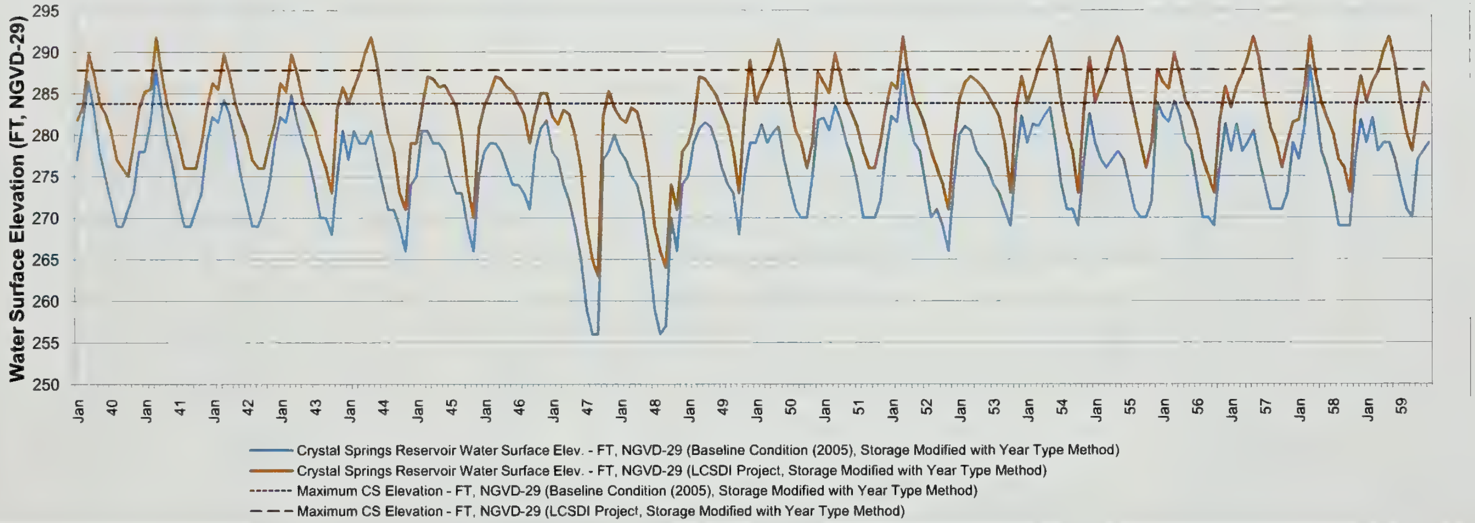


CHART 3 CRYSTAL SPRINGS WATER SURFACE ELEVATIONS

1920 - 1939

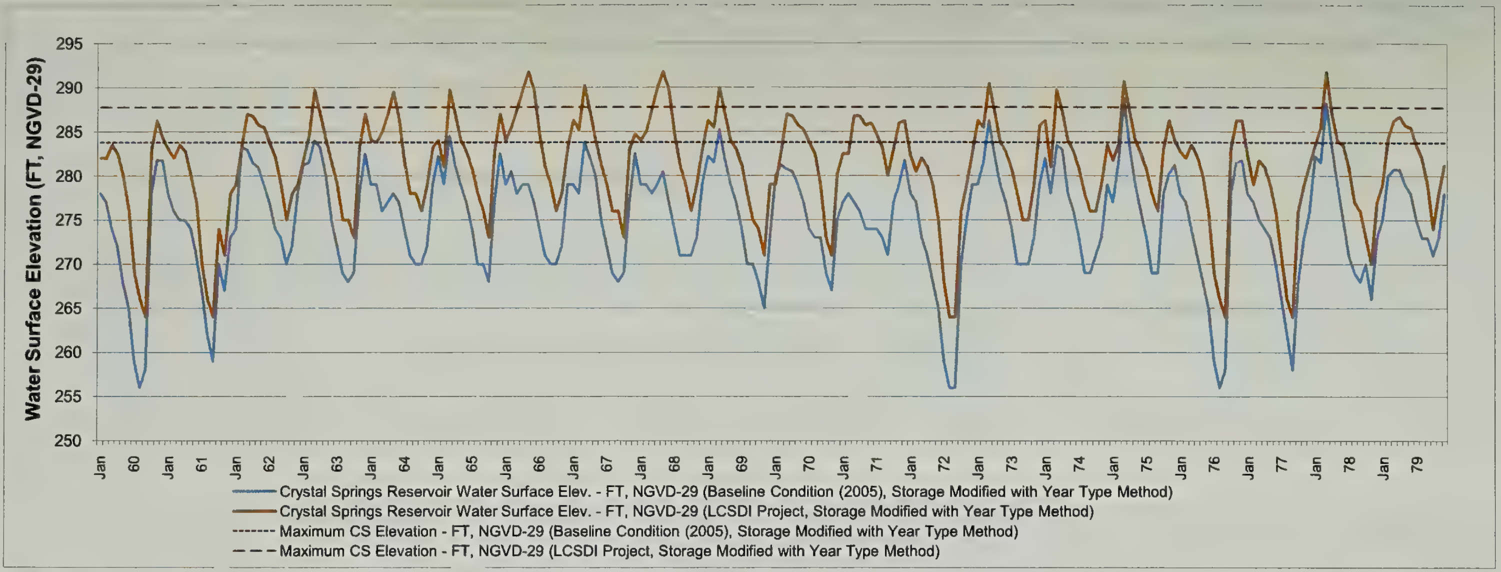


1940 - 1959



1960 - 1979

CHART 3 CRYSTAL SPRINGS WATER SURFACE ELEVATIONS



1980 - 2002

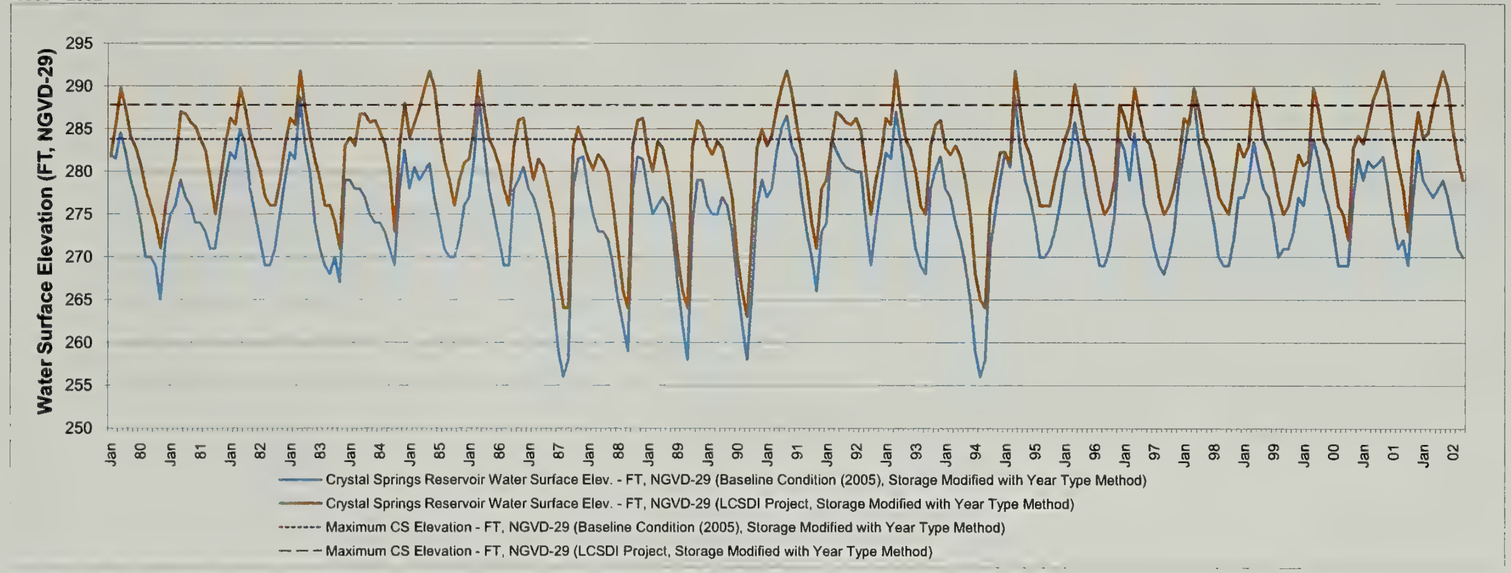


TABLE 3 - FREQUENCY OF INUNDATION

Number/Percentage of Months Water Surface in UPPER/LOWER CRYSTAL SPRINGS RESERVOIR Exceeds an Ele

	Number		Percentage	
Water Surface Elevation (FT, NGVD-29)	Baseline Condition (2005), Storage Modified with Year Type Method	LCSDI Project, Storage Modified with Year Type Method	Baseline Condition (2005), Storage Modified with Year Type Method	LCSDI Project, Storage Modified with Year Type Method
292.0	0	0	0.0%	0.0%
291.5	0	24	0.0%	2.4%
291.0	0	25	0.0%	2.5%
290.5	0	26	0.0%	2.6%
290.0	0	33	0.0%	3.4%
289.5	0	70	0.0%	7.1%
289.0	0	78	0.0%	7.9%
288.5	6	84	0.6%	8.5%
288.0	8	85	0.8%	8.6%
287.5	10	89	1.0%	9.0%
287.0	11	128	1.1%	13.0%
286.5	12	173	1.2%	17.6%
286.0	15	204	1.5%	20.7%
285.5	18	244	1.8%	24.8%
285.0	20	289	2.0%	29.4%
284.5	22	316	2.2%	32.1%
284.0	27	329	2.7%	33.4%
283.5	36	391	3.7%	39.7%
283.0	57	440	5.8%	44.7%
282.5	66	500	6.7%	50.8%
282.0	98	536	10.0%	54.5%
281.5	122	570	12.4%	57.9%
281.0	167	599	17.0%	60.9%
280.5	186	635	18.9%	64.5%
280	217	650	22.1%	66.1%
279	237	669	24.1%	68.0%
278	329	748	33.4%	76.0%
277	404	781	41.1%	79.4%
276	485	797	49.3%	81.0%
275	516	859	52.4%	87.3%
274	561	885	57.0%	89.9%
273	632	900	64.2%	91.5%
272	684	919	69.5%	93.4%
271	716	920	72.8%	93.5%
270	776	937	78.9%	95.2%
Total Months	984	984		

TABLE 4 - U/L CRYSTAL SPRINGS WATER SURFACE ELEVATIONS

Matrix Data for Water Year 1921-2002 Rank Ordered by Descending 5 RESERVOIR INDEX (Aggregated Annual Inflow to 5 Bay Area Reservoirs)

Crystal Springs Reservoir Water Surface Elevation (FT, NGVD-29)

Baseline Condition (2005)

Yr Type	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
W	1983	271.0	275.0	279.0	282.3	281.5	288.8	283.3	280.0	274.0	271.0	269	268
W	1998	270.0	273.0	279.0	282.3	286.0	288.8	283.3	280.0	277.0	274.0	270	269
W	1958	271.0	273.0	279.0	277.0	281.0	288.3	283.3	278.0	276.0	273.0	269	269
W	1941	271.0	273.0	278.0	278.0	281.5	287.8	283.3	279.0	276.0	272.0	269	269
W	1982	271.0	275.0	279.0	282.3	281.5	285.0	283.3	278.0	275.0	272.0	269	269
W	1995	271.0	275.0	279.0	282.3	280.5	288.8	282.8	279.0	277.0	274.0	270	270
W	1956	270.0	272.0	283.8	282.3	281.5	284.0	282.3	279.0	278.0	274.0	270	270
W	1952	270.0	272.0	278.0	282.3	281.5	287.8	282.0	279.0	278.0	274.0	270	271
W	1938	271.0	273.0	278.0	277.0	281.5	288.8	283.3	279.0	276.0	273.0	269	269
W	1997	271.0	275.0	283.8	282.5	279.0	284.5	280.3	276.0	274.0	271.0	269	268
W	1969	271.0	273.0	279.0	282.3	281.5	285.3	281.8	279.0	277.0	274.0	270	270
W	1973	270.0	275.0	279.0	279.0	281.5	286.3	282.3	279.0	277.0	274.0	270	270
W	1986	270.0	272.0	276.0	277.0	281.5	288.8	283.3	278.0	275.0	272.0	269	269
W	1980	271.0	273.0	278.0	282.0	281.5	284.5	282.3	279.0	277.0	274.0	270	270
W	1942	271.0	273.0	279.0	282.3	281.5	284.3	282.5	279.0	275.0	272.0	269	269
W	1967	270.0	272.0	279.0	279.0	278.0	283.8	282.0	280.0	275.0	272.0	269	268
AN	1963	270.0	272.0	278.0	281.3	281.5	284.0	283.3	280.0	275.0	272.0	269	268
AN	1940	270.0	272.0	276.0	277.0	281.5	286.5	283.0	278.0	275.0	272.0	269	269
AN	1965	270.0	272.0	279.0	282.3	279.0	284.5	281.3	279.0	277.0	274.0	270	270
AN	1996	271.0	273.0	276.0	280.0	281.5	285.8	282.5	278.0	275.0	272.0	269	269
AN	1922	270.0	272.0	279.0	277.0	281.5	286.0	283.0	278.0	275.0	271.0	269	269
AN	1975	271.0	273.0	279.0	277.0	281.5	288.8	283.3	279.0	276.0	273.0	269	269
AN	1974	270.0	273.0	279.0	282.0	278.0	283.5	283.0	278.0	276.0	273.0	269	269
AN	1978	268.0	273.0	276.0	282.3	281.5	288.3	283.3	279.0	275.0	271.0	269	268
AN	1993	269.0	274.0	278.0	282.3	281.5	287.0	283.3	279.0	275.0	271.0	269	268
AN	1951	270.0	275.0	281.8	282.0	280.5	283.5	281.8	279.0	277.0	274.0	270	270
AN	1943	271.0	274.0	279.0	282.3	281.5	284.8	281.5	279.0	277.0	274.0	270	270
AN	1927	271.0	275.0	278.0	277.0	280.8	283.5	282.8	279.0	277.0	274.0	270	270
AN	1937	271.0	273.0	277.0	275.0	276.0	284.3	282.8	278.0	275.0	272.0	269	269
AN	2000	271.0	273.0	277.0	276.0	280.0	283.8	281.5	278.0	276.0	273.0	269	269
AN	1921	271.0	274.0	279.0	281.8	281.3	283.5	279.0	275.0	273.0	271.0	269	268
AN	1999	269.0	272.0	277.0	277.0	279.0	283.5	280.5	278.0	277.0	274.0	270	271
AN	1923	271.0	274.0	279.0	279.0	277.0	280.3	277.0	273.0	272.0	271.0	269	269
N	1953	269.0	266.0	274.0	280.0	281.0	280.5	278.0	277.0	276.0	274.0	273	271
N	1928	268.0	265.0	272.0	274.0	277.0	280.8	282.8	281.5	280.0	277.0	274	273
N	1970	268.0	265.0	273.0	280.0	281.3	280.8	280.5	279.0	277.0	274.0	273	273
N	1984	270.0	267.0	279.0	279.0	278.0	278.0	277.0	275.0	274.0	274.0	273	271
N	1946	269.0	266.0	275.0	278.0	279.0	279.0	278.0	276.0	274.0	274.0	273	271
N	1926	268.0	264.0	271.0	275.0	283.8	281.3	280.8	279.0	277.0	274.0	273	273
N	1936	270.0	266.0	274.0	275.0	282.3	280.8	280.3	278.0	277.0	274.0	273	273
N	1945	269.0	266.0	274.0	275.0	280.5	280.5	279.0	279.0	278.0	275.0	273	273
N	1971	269.0	267.0	275.0	277.0	278.0	277.0	276.0	274.0	274.0	274.0	273	271
N	1935	270.0	267.0	274.0	276.0	278.0	279.0	282.0	280.5	276.0	274.0	273	272
N	1932	269.0	267.0	277.0	280.3	283.8	281.3	281.3	280.5	280.0	277.0	274	272
N	1979	270.0	266.0	273.0	275.0	280.0	280.8	280.8	279.0	278.0	275.0	273	273
N	1962	270.0	267.0	273.0	274.0	283.3	283.0	281.5	281.0	279.0	277.0	274	273
N	1949	270.0	266.0	274.0	275.0	279.0	280.8	281.5	281.0	279.0	276.0	274	273
N	1992	270.0	266.0	273.0	274.0	283.8	282.5	281.3	280.5	280.3	280.0	280	274
N	1981	269.0	265.0	272.0	275.0	276.0	279.0	277.0	276.0	274.0	274.0	273	271
BN	2001	269.0	277.0	281.5	279.0	281.3	280.5	281.0	281.8	278.0	274.0	271	272
BN	1930	268.0	275.0	280.0	279.0	281.3	282.0	282.5	283.5	279.0	274.0	271	271
BN	1954	269.0	277.0	282.3	279.0	281.3	281.0	282.3	283.3	279.0	274.0	271	271
BN	1968	269.0	277.0	282.5	279.0	279.0	278.0	279.0	280.5	277.0	274.0	271	271
BN	1959	269.0	277.0	281.8	279.0	282.0	278.0	279.0	279.0	277.0	274.0	271	270
BN	1925	269.0	278.0	282.5	279.0	281.3	280.3	283.5	287.5	283.5	277.0	272	271
BN	1944	268.0	275.0	280.5	277.0	280.5	279.0	279.0	280.5	277.0	274.0	271	271
BN	2002	269.0	277.0	282.5	279.0	278.0	277.0	278.0	279.0	277.0	274.0	271	270
BN	1950	268.0	275.0	279.0	279.0	281.3	279.0	280.3	281.0	277.0	274.0	271	270
BN	1966	268.0	277.0	282.5	279.0	280.5	278.0	279.0	279.0	277.0	274.0	271	270
BN	1955	269.0	277.0	282.5	279.0	277.0	276.0	277.0	278.0	277.0	274.0	271	270
BN	1957	269.0	276.0	281.3	278.0	281.3	278.0	279.0	280.5	277.0	274.0	271	271
BN	1934	268.0	275.0	282.5	279.0	281.3	279.0	279.0	280.5	277.0	274.0	271	273
BN	1985	269.0	278.0	282.5	278.0	280.5	279.0	280.0	281.0	277.0	274.0	271	270
BN	1991	266.0	276.0	279.0	277.0	278.0	282.5	285.3	286.5	283.0	281.8	277	273
BN	1929	268.0	275.0	280.0	278.0	279.0	278.0	279.0	280.3	277.0	274.0	271	270
BN	1964	269.0	278.0	282.5	279.0	279.0	276.0	277.0	278.0	277.0	274.0	271	270
D	1947	278.0	280.8	281.8	278.0	277.0	274.0	272.0	269.0	265.0	259.0	256	256
D	1994	278.0	280.3	281.8	278.0	277.0	274.0	272.0	269.0	265.0	259.0	256	258
D	1939	278.0	280.3	281.8	277.0	276.0	274.0	272.0	269.0	265.0	259.0	256	256
D	1948	277.0	278.0	280.0	278.0	277.0	275.0	274.0	271.0	266.0	259.0	256	257
D	1960	277.0	278.0	279.0	278.0	277.0	274.0	272.0	268.0	265.0	259.0	256	258
D	1972	277.0	279.0	281.8	278.0	277.0	273.0	271.0	268.0	265.0	259.0	256	256
D	1933	277.0	279.0	280.0	277.0	274.0	272.0	270.0	267.0	265.0	259.0	256	256
D	1961	278.0	281.8	281.8	278.0	276.0	275.0	275.0	274.0	271.0	267.0	262	259
D	1990	274.0	279.0	279.0	276.0	275.0	275.0	277.0	276.0	273.0	267.0	262	258
D	1987	278.0	279.0	280.5	278.0	277.0	275.0	272.0	269.0	265.0	259.0	256	258
D	1988	278.0	281.5	281.8	278.0	275.0	273.0	273.0	272.0	269.0	265.0	262	259
D	1989	278.0	281.8	281.5	278.0	275.0	276.0	277.0	276.0	273.0	267.0	262	258
D	1931	278.0	280.0	281.0	278.0	277.0	274.0	271.0	268.0	265.0	261.0	261	259
D	1976	278.0	280.3	281.3	278.0	277.0	274.0	271.0	268.0	265.0	259.0	256	258
D	1977	278.0	281.5	281.8	278.0	277.0	275.0	274.0	273.0	270.0	266.0	262	258
D	1924	278.0	280.0	280.8	278.0	277.0	273.0	271.0	267.0	265.0	259.0	256	258

TABLE 4 - U/L CRYSTAL SPRINGS WATER SURFACE ELEVATIONS

Matrix Data for Water Year 1921-2002 Rank Ordered by Descending 5 RESERVOIR INDEX (Aggregated Annual Inflow to 5 Bay Area Reservoirs)

Crystal Springs Reservoir Water Surface Elevation (FT, NGVD-29)

LCSDI Project

Yr Type	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
W	1983	276	279	283	286	286	292	287	284	281	279	276	276
W	1998	276	278	281	286	286	290	287	284	283	281	277	276
W	1958	276	279	282	282	286	292	287	284	282	280	277	276
W	1941	275	279	283	285	286	292	287	284	282	279	276	276
W	1982	275	279	283	286	286	290	287	284	282	280	277	276
W	1995	276	279	282	282	281	292	287	284	282	279	276	276
W	1956	276	279	288	286	286	290	287	284	283	281	277	275
W	1952	276	279	283	286	286	292	287	284	283	281	278	276
W	1938	276	279	283	282	286	292	287	284	283	281	278	276
W	1997	276	279	288	286	284	290	287	284	283	281	277	275
W	1969	276	279	283	286	286	290	287	284	283	281	278	275
W	1973	276	279	283	286	286	291	287	284	283	281	278	275
W	1986	276	279	281	282	286	292	287	284	283	281	278	276
W	1980	274	278	281	282	286	290	287	284	283	281	278	276
W	1942	276	279	283	286	286	290	287	284	282	280	277	276
W	1967	276	278	283	286	285	290	287	284	281	279	276	276
AN	1963	275	278	279	282	285	290	287	284	282	279	275	275
AN	1940	276	279	283	282	284	290	287	284	283	281	277	276
AN	1965	276	279	283	284	281	290	287	284	283	281	278	276
AN	1996	276	279	282	284	286	290	287	284	283	280	277	275
AN	1922	275	279	283	282	286	290	287	284	283	281	277	276
AN	1975	276	279	284	282	284	291	287	284	283	281	278	276
AN	1974	275	279	286	286	281	290	287	284	283	281	278	276
AN	1978	276	279	281	284	286	292	287	284	284	281	277	276
AN	1993	275	279	282	286	286	292	287	284	283	280	276	275
AN	1951	276	279	288	286	285	290	287	284	283	281	278	276
AN	1943	276	279	282	286	285	290	287	284	283	281	278	276
AN	1927	275	279	283	282	285	290	287	284	283	281	278	276
AN	1937	276	279	283	281	283	291	287	284	283	281	277	276
AN	2000	276	279	282	281	281	290	287	284	283	280	276	275
AN	1921	275	279	283	286	285	290	287	284	283	281	278	276
AN	1999	275	279	283	282	283	290	287	284	283	280	277	275
AN	1923	275	278	286	286	285	291	287	284	283	281	278	276
N	1953	274	271	279	284	286	287	287	286	285	284	282	279
N	1928	274	271	278	279	283	287	287	286	285	284	283	279
N	1970	274	271	279	279	283	287	287	286	285	284	283	279
N	1984	274	271	283	284	283	287	287	286	286	285	283	280
N	1946	274	270	281	284	285	287	287	286	285	284	283	279
N	1926	274	271	276	279	285	287	287	286	286	284	283	279
N	1936	274	271	275	279	285	287	287	286	285	284	282	279
N	1945	273	271	279	279	283	287	287	286	286	285	284	280
N	1971	273	271	280	283	283	287	287	286	286	285	283	280
N	1935	274	271	277	279	283	287	287	286	285	283	281	279
N	1932	274	271	278	279	285	288	287	286	286	284	282	279
N	1979	273	270	277	279	284	286	287	286	286	284	282	279
N	1962	274	271	278	279	283	287	287	286	286	284	282	279
N	1949	274	271	278	279	282	287	287	286	285	283	281	278
N	1992	274	271	278	279	283	287	287	286	286	286	285	280
N	1981	274	271	276	279	282	287	287	286	285	284	283	279
BN	2001	272	283	284	283	286	289	290	292	289	284	281	278
BN	1930	273	283	286	284	286	288	290	292	290	285	281	279
BN	1954	273	283	287	284	286	288	290	292	289	284	281	278
BN	1968	273	283	285	284	285	288	290	292	290	285	281	279
BN	1959	273	283	287	284	286	288	290	292	289	284	280	278
BN	1925	273	283	286	284	286	288	290	292	290	285	281	279
BN	1944	273	283	286	284	286	288	290	292	289	284	280	278
BN	2002	273	283	287	284	285	288	290	292	290	285	281	279
BN	1950	273	283	289	284	286	287	289	292	289	284	281	279
BN	1966	273	283	287	284	286	288	290	292	290	285	281	279
BN	1955	273	283	289	284	286	288	290	292	290	286	282	279
BN	1957	273	282	286	283	286	287	289	292	289	284	281	279
BN	1934	273	283	287	284	286	288	290	292	290	286	282	279
BN	1985	273	283	288	284	286	288	290	292	290	285	281	279
BN	1991	273	283	285	283	284	288	290	292	289	286	282	279
BN	1929	273	283	287	284	284	287	290	292	290	285	281	279
BN	1964	273	283	287	284	284	285	287	290	287	282	278	278
D	1947	283	285	285	282	281	283	283	280	276	269	265	263
D	1994	283	286	286	283	282	283	282	279	275	268	265	264
D	1939	283	286	286	282	280	282	281	279	275	268	264	264
D	1948	282	285	283	282	282	283	283	280	276	269	266	264
D	1960	283	286	285	282	282	284	283	280	276	269	266	264
D	1972	283	286	286	282	281	282	281	279	275	268	264	264
D	1933	283	285	283	282	281	282	281	278	274	267	263	264
D	1961	283	286	284	283	282	284	283	280	277	270	266	264
D	1990	283	286	285	283	282	284	283	280	277	270	266	263
D	1987	283	286	286	282	279	282	281	278	275	268	264	264
D	1988	283	285	284	282	280	282	281	280	276	271	266	264
D	1989	283	286	286	282	280	284	283	280	276	270	266	264
D	1931	283	286	284	283	282	284	282	280	276	271	266	264
D	1976	283	286	284	283	282	284	282	280	276	269	266	264
D	1977	283	286	286	282	279	282	281	279	276	271	266	264
D	1924	283	286	286	283	281	282	281	279	275	268	265	264

TABLE 4 - U/L CRYSTAL SPRINGS WATER SURFACE ELEVATIONS

Matrix Data for Water Year 1921-2002 Rank Ordered by Descending 5 RESERVOIR INDEX (Aggregated Annual Inflow to 5 Bay Area Reservoirs)

Crystal Springs Reservoir Water Surface Elevation (FT, NGVD-29)

LCSDI Project minus
Baseline Condition (2005)

Yr Type	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
W	1983	5	4	4	4	4	3	4	4	7	8	7	8
W	1998	6	5	2	4	-1	1	4	4	6	7	7	7
W	1958	5	6	3	5	5	4	4	6	6	7	8	7
W	1941	4	6	5	7	4	4	4	5	6	7	7	7
W	1982	4	4	4	4	4	5	4	6	7	8	8	7
W	1995	5	4	3	0	1	3	5	5	5	5	6	6
W	1956	6	7	4	4	4	6	5	5	5	7	7	5
W	1952	6	7	5	4	4	4	5	5	5	7	8	5
W	1938	5	6	5	5	4	3	4	5	7	8	9	7
W	1997	5	4	4	4	5	5	7	8	9	10	8	7
W	1969	5	6	4	4	4	5	5	5	6	7	8	5
W	1973	6	4	4	7	4	4	5	5	6	7	8	5
W	1986	6	7	5	5	4	3	4	6	8	9	9	7
W	1980	3	5	3	0	4	5	5	5	6	7	8	6
W	1942	5	6	4	4	4	6	5	5	7	8	8	7
W	1967	6	6	4	7	7	6	5	4	6	7	7	8
AN	1963	5	6	1	1	3	6	4	4	7	7	6	7
AN	1940	6	7	7	5	2	3	4	6	8	9	8	7
AN	1965	6	7	4	2	2	5	6	5	6	7	8	6
AN	1996	5	6	6	4	4	5	5	6	8	8	8	6
AN	1922	5	7	4	5	4	4	4	6	8	10	8	7
AN	1975	5	6	5	5	2	2	4	5	7	8	9	7
AN	1974	5	6	7	4	3	6	4	6	7	8	9	7
AN	1978	8	6	5	1	4	4	4	5	9	10	8	8
AN	1993	6	5	4	4	4	5	4	5	8	9	7	7
AN	1951	6	4	6	4	5	6	5	5	6	7	8	6
AN	1943	5	5	3	4	4	5	6	5	6	7	8	6
AN	1927	4	4	5	5	5	6	5	5	6	7	8	6
AN	1937	5	6	6	6	7	6	5	6	8	9	8	7
AN	2000	5	6	5	5	1	6	6	6	7	7	7	6
AN	1921	4	5	4	4	3	7	8	9	10	10	9	8
AN	1999	6	7	6	5	4	6	7	6	6	6	7	4
AN	1923	4	4	7	7	8	10	10	11	11	10	9	7
N	1953	5	5	5	4	5	7	9	9	9	10	9	8
N	1928	6	6	6	5	6	6	4	4	5	7	9	6
N	1970	6	6	6	-1	2	6	6	7	8	10	10	6
N	1984	4	4	4	5	5	9	10	11	12	11	10	9
N	1946	5	4	6	6	6	8	9	10	11	10	10	8
N	1926	6	7	5	4	1	6	6	7	9	10	10	6
N	1936	4	5	1	4	3	6	7	8	8	10	9	6
N	1945	4	5	5	4	3	7	8	7	8	10	11	7
N	1971	4	4	5	6	5	10	11	12	12	11	10	9
N	1935	4	4	3	3	5	8	5	5	9	9	8	7
N	1932	5	4	1	-1	1	6	6	5	6	7	8	7
N	1979	3	4	4	4	4	6	6	7	8	9	9	6
N	1962	4	4	5	5	0	4	5	5	7	7	8	6
N	1949	4	5	4	4	3	6	5	5	6	7	7	5
N	1992	4	5	5	5	-1	5	5	5	5	6	5	6
N	1981	5	6	4	4	6	8	10	10	11	10	10	8
BN	2001	3	6	3	4	5	8	9	10	11	10	10	6
BN	1930	5	8	6	5	5	6	8	8	11	11	10	8
BN	1954	4	6	5	5	5	7	8	9	10	10	10	7
BN	1968	4	6	2	5	6	10	11	11	13	11	10	8
BN	1959	4	6	5	5	4	10	11	13	12	10	9	8
BN	1925	4	5	3	5	5	7	7	4	7	8	9	8
BN	1944	5	8	5	7	5	9	11	11	12	10	9	7
BN	2002	4	6	5	5	7	11	12	13	13	11	10	9
BN	1950	5	8	10	5	5	8	9	11	12	10	10	9
BN	1966	5	6	5	5	5	10	11	13	13	11	10	9
BN	1955	4	6	7	5	9	12	13	14	13	12	11	9
BN	1957	4	6	5	5	5	9	10	11	12	10	10	8
BN	1934	5	8	5	5	4	9	11	11	13	12	11	6
BN	1985	4	5	6	6	5	9	10	11	13	11	10	9
BN	1991	7	7	6	6	6	5	5	5	6	4	5	6
BN	1929	5	8	7	6	5	9	11	12	13	11	10	9
BN	1964	4	5	5	5	5	9	10	12	10	8	7	8
D	1947	5	4	3	4	4	9	11	11	11	10	9	7
D	1994	5	5	4	5	5	9	10	10	10	9	9	6
D	1939	5	6	4	5	4	8	9	10	10	9	8	8
D	1948	5	7	3	4	5	8	9	9	10	10	10	7
D	1960	6	8	6	4	5	10	11	12	11	10	10	6
D	1972	6	7	5	4	4	9	10	11	10	9	8	8
D	1933	6	6	3	5	7	10	11	11	9	8	7	8
D	1961	5	5	3	5	6	9	8	6	6	3	4	5
D	1990	9	7	6	7	7	9	6	4	4	3	4	5
D	1987	5	7	6	4	2	7	9	9	10	9	8	6
D	1988	5	4	2	4	5	9	8	8	7	6	4	5
D	1989	5	4	5	4	5	8	6	4	3	3	4	6
D	1931	5	6	3	5	5	10	11	12	11	10	5	5
D	1976	5	6	3	5	5	10	11	12	11	10	10	6
D	1977	5	5	5	4	2	7	7	6	6	5	4	6
D	1924	5	6	5	5	4	9	10	12	10	9	9	6

Attachment D: HH/LSM Results, No Scaling

SUMMARY OF MODEL RUNS AND ANALYSES

Model Runs Compared:

File:	Steiner XL Doc: LCSDIP Variant (Steiner_01_25_09).xls
Run:	Baseline Condition (2005) Baseline 265mgd Existing Setting, CSR Max Op 283.8' w/ 2bg winter buffer
File:	Steiner XL Doc: LCSDIP Variant (Steiner_01_25_09).xls
Runs:	LCSDI Project LCSDI Project net 265mgd, 10mgd R/C/GW, CSR Max Op 287.8' with 2bg winter buffer

Index (Methodology for Ranking of Water Years 1921-2002):

5 RESERVOIR INDEX
(Years sorted according to Aggregated Annual Inflow to 5 Alameda and Peninsula Reservoirs)

Summary of Tables & Charts Prepared from HH/LSM Output:

Table 1 - Avg Monthly Reservoir Storage Comparison by Hydrologic Year Type
Chart 1 - Reservoir Storage Comparison, Monthly Averages for All Years
Table 2 - Avg Monthly Reservoir Water Surface Elevations & Depths by Hydrologic Year Type
Chart 2 - Reservoir Water Surface Elevation & Depth Comparison, Monthly Average for All Years
Chart 3 - Water Surface Elevations for 82-year Hydrologic Record
Table 3 - Number/Percentage of Months Water Surface Equals or Exceeds a Given Elevation
Table 4 - All Monthly Data for 82-year Hydrologic Record & Delta Between Compared Model Runs

Table 1
Estimated Average Monthly Storage in UPPER/LOWER CRYSTAL SPRINGS RESERVOIR by Hydrologic Year Type (MG)
5 RESERVOIR INDEX (Years sorted according to Aggregated Annual Inflow to 5 Alameda and Peninsula Reservoirs)

Baseline Condition (2005)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept
All	16,217	15,867	16,358	17,012	17,199	16,407	17,203	17,074	16,179	15,628	15,324	15,854
Wet	16,241	15,894	16,653	17,911	18,492	17,666	18,238	18,160	16,778	15,707	15,184	15,937
Above Normal	16,035	15,782	16,305	17,449	18,036	16,989	18,012	17,837	16,527	15,521	15,104	15,904
Normal	16,324	15,912	16,447	17,030	17,167	16,380	17,387	17,272	16,307	15,561	15,232	15,789
Below Normal	16,205	15,824	16,189	16,287	16,150	15,658	16,245	16,017	15,411	15,319	15,199	15,568
Dry	16,293	15,931	16,210	16,399	16,164	15,351	16,140	16,102	15,901	16,059	15,921	16,086

LCSDI Project

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept
All	18,214	17,816	17,528	18,708	18,827	19,049	20,143	20,217	19,510	18,990	18,598	18,733
Wet	18,243	17,970	17,917	19,642	20,104	19,546	20,249	20,250	19,205	18,603	18,209	18,718
Above Normal	18,201	17,726	17,585	19,078	19,593	19,193	20,243	20,253	19,346	18,709	18,285	18,605
Normal	18,213	17,786	17,612	18,636	18,450	18,995	20,260	20,279	19,593	19,007	18,568	18,645
Below Normal	18,182	17,697	17,111	18,169	18,121	18,911	20,121	20,211	19,702	19,173	18,824	18,812
Dry	18,232	17,913	17,435	18,026	17,862	18,600	19,838	20,090	19,703	19,465	19,111	18,886

Percent Change, Baseline vs LCSDI Project

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept
All	12%	12%	7%	10%	9%	16%	17%	18%	21%	22%	21%	18%
Wet	12%	13%	8%	10%	9%	11%	11%	12%	14%	18%	20%	17%
Above Normal	14%	12%	8%	9%	9%	13%	12%	14%	17%	21%	21%	17%
Normal	12%	12%	7%	9%	7%	16%	17%	17%	20%	22%	22%	18%
Below Normal	12%	12%	6%	12%	12%	21%	24%	26%	28%	25%	24%	21%
Dry	12%	12%	8%	10%	11%	21%	23%	25%	24%	21%	20%	17%

CHART 1 - Reservoir Storage Volume, Monthly Averages for All Years
UPPER/LOWER CRYSTAL SPRINGS RESERVOIR

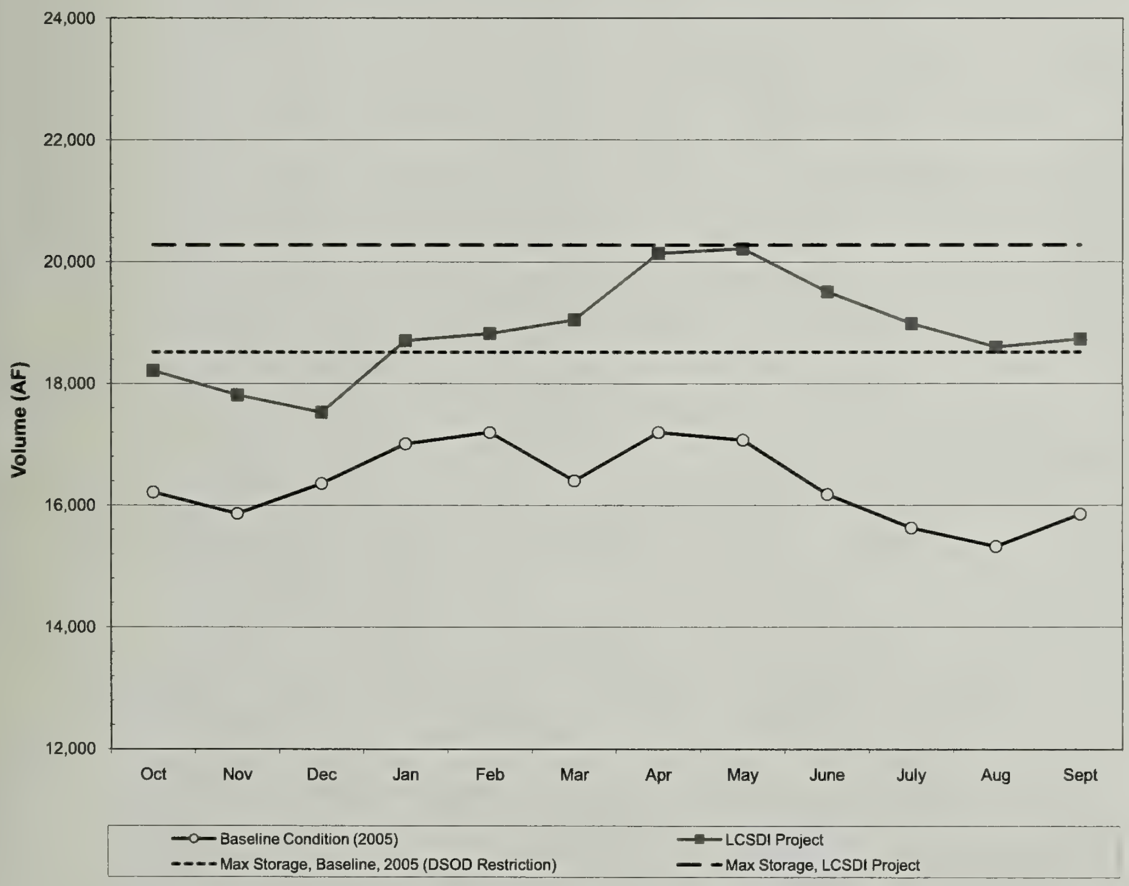


Table 2

Estimated Average Monthly Reservoir Water Surface Elevation in U/L CRYSTAL SPRINGS by Hydrologic Year Type (FT, NGVD-29)
5 RESERVOIR INDEX (Years sorted according to Aggregated Annual Inflow to 5 Alameda and Peninsula Reservoirs)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept
Baseline Condition (2005)												
All	278	277	278	280	281	278	281	280	278	276	275	277
Wet	278	277	279	282	284	282	283	283	279	276	275	277
Above Normal	277	276	278	281	283	280	283	282	278	276	275	277
Normal	278	277	278	280	281	278	281	281	278	276	275	276
Below Normal	278	277	278	278	277	276	278	277	275	275	275	276
Dry	278	277	278	278	277	275	277	277	277	277	277	277
LCSDI Project												
All	283	282	281	284	285	285	287	288	286	285	284	284
Wet	283	282	282	286	287	286	288	288	285	284	283	284
Above Normal	283	282	282	285	286	285	288	288	286	284	283	284
Normal	283	282	282	284	284	285	288	288	286	285	284	284
Below Normal	283	282	280	283	283	285	287	288	287	285	285	284
Dry	283	282	281	283	282	284	287	287	287	286	285	285
Delta, Baseline vs LCSDI Project												
All	5	5	3	4	4	7	7	7	8	9	9	7
Wet	5	5	3	4	4	4	5	5	6	8	8	7
Above Normal	6	6	4	4	4	5	5	6	8	8	8	7
Normal	5	5	4	4	3	7	7	7	8	9	9	8
Below Normal	5	5	2	5	6	9	9	11	12	10	10	8
Dry	5	5	3	5	5	9	10	10	10	9	8	8

CHART 2 - Reservoir Water Surface Elevations and Depth,
Monthly Average for All Years
U/L CRYSTAL SPRINGS RESERVOIR

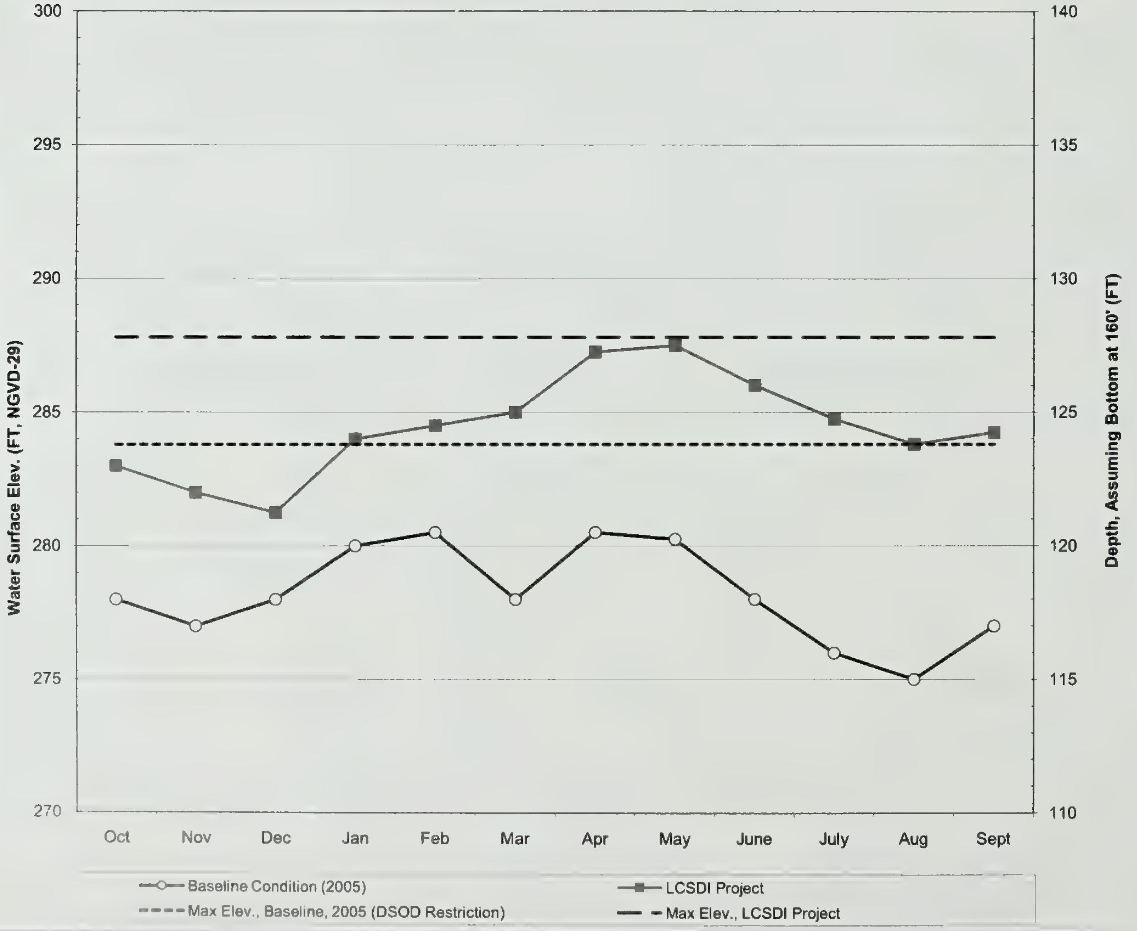
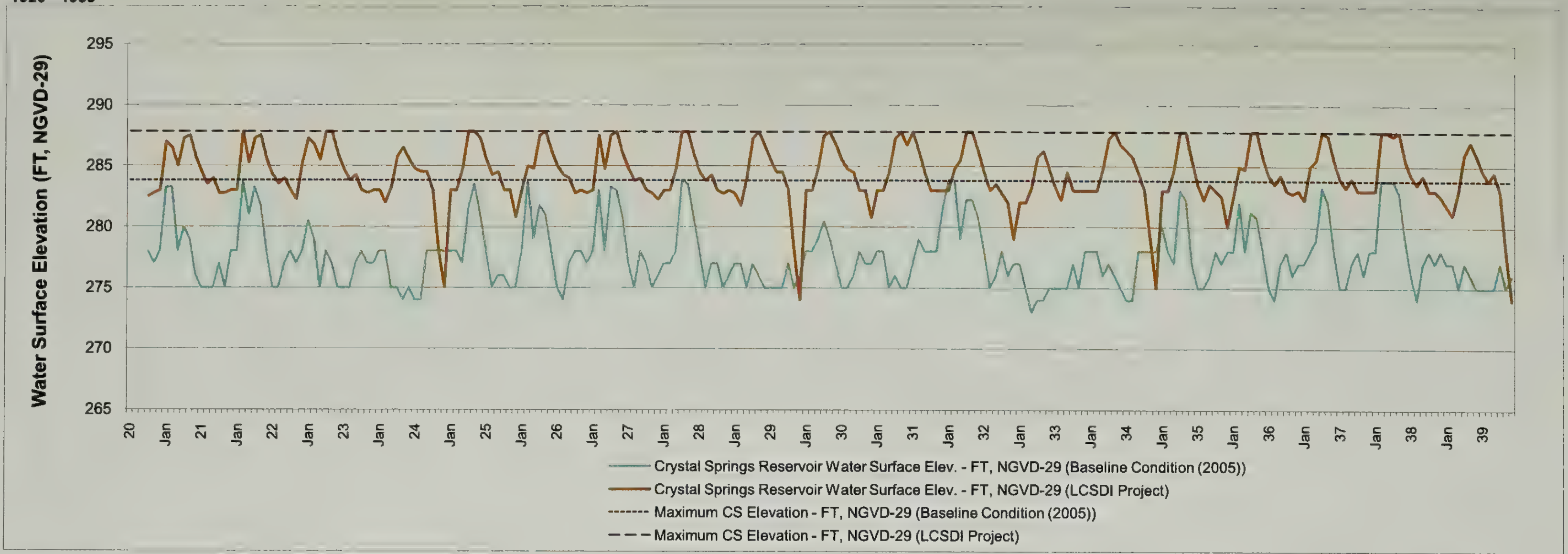


CHART 3 CRYSTAL SPRINGS WATER SURFACE ELEVATIONS

1920 - 1939



1940 - 1959

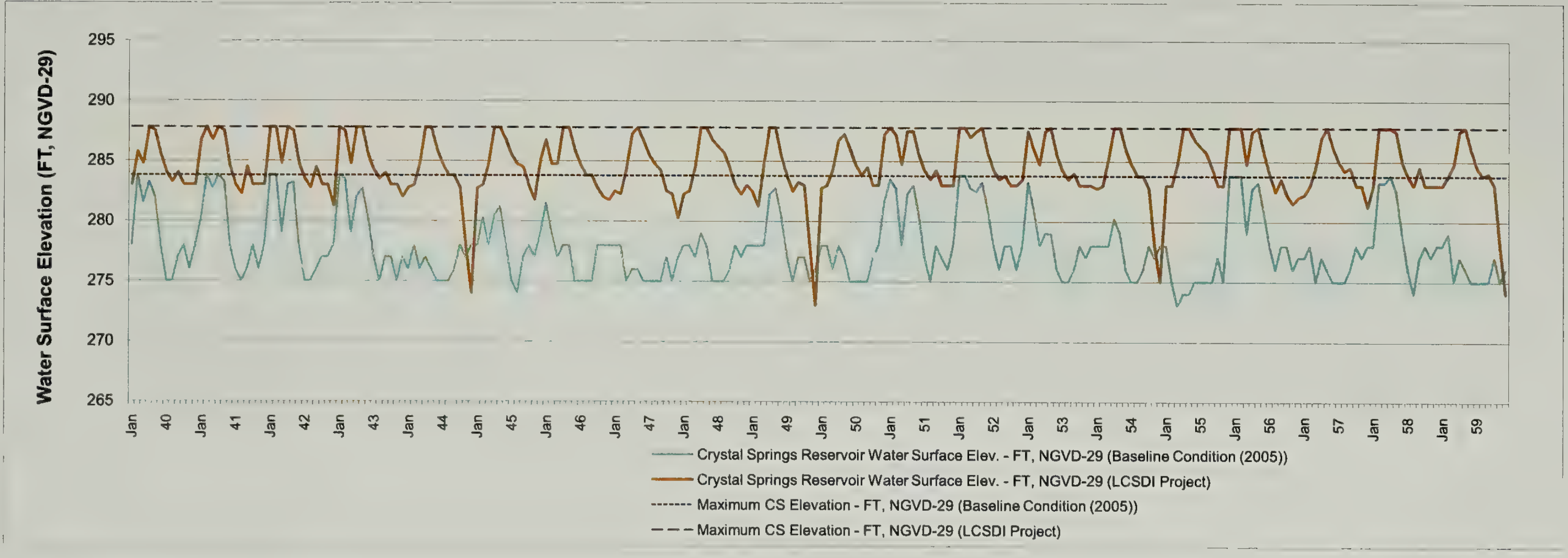
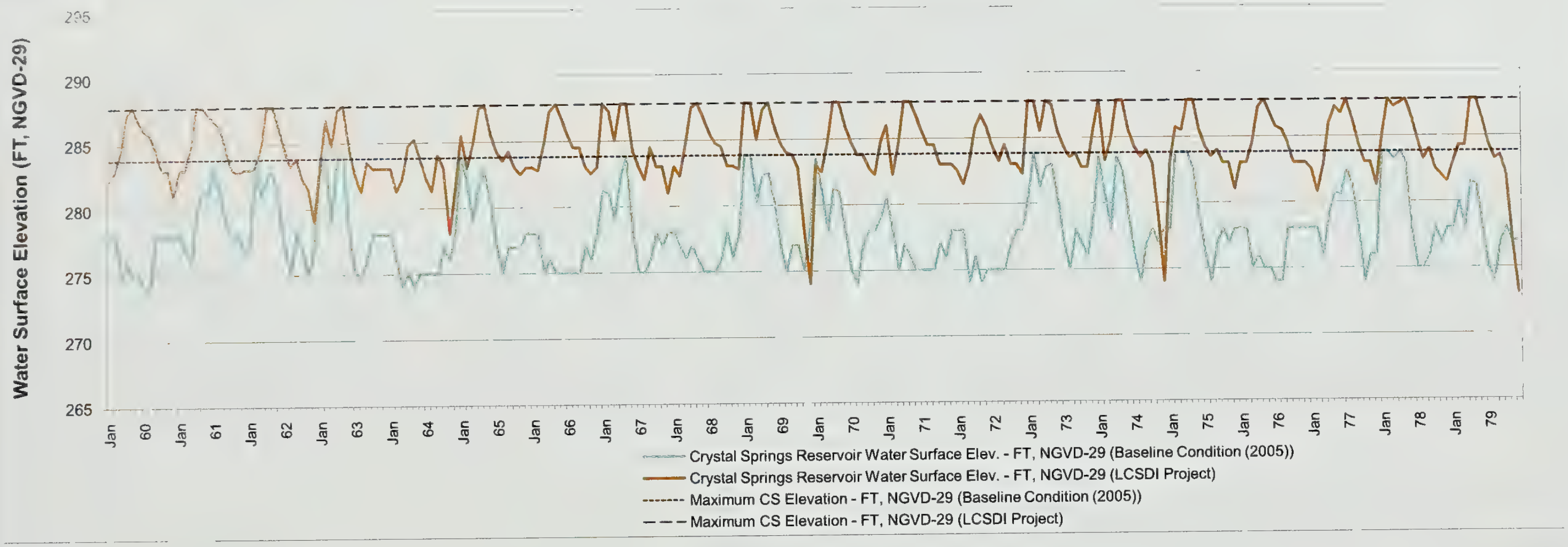


CHART 3 CRYSTAL SPRINGS WATER SURFACE ELEVATIONS

1960 - 1979



1980 - 2002

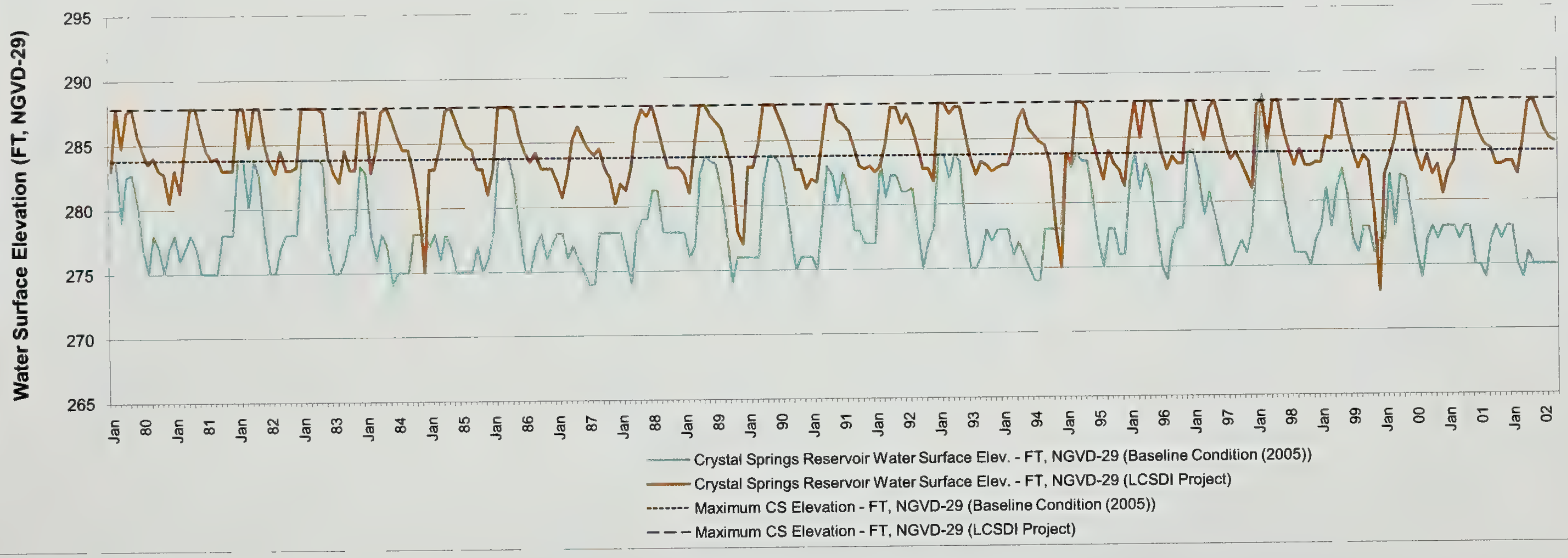


TABLE 3 - FREQUENCY OF INUNDATION
Number/Percentage of Months WS Elevation is Equal to, or Exceeds, a Given Water Surface Elevation

	Number		Percentage	
Water Surface Elevation (FT, NGVD-29)	Baseline Condition (2005)	LCSDI Project	Baseline Condition (2005)	LCSDI Project
292	0	0	0.0%	0.0%
291	0	0	0.0%	0.0%
290	0	0	0.0%	0.0%
289	1	0	0.1%	0.0%
288	1	201	0.1%	20.4%
287	1	261	0.1%	26.5%
286	1	347	0.1%	35.3%
285	1	520	0.1%	52.8%
284	94	619	9.6%	62.9%
283	139	894	14.1%	90.9%
282	178	935	18.1%	95.0%
281	223	951	22.7%	96.6%
280	228	952	23.2%	96.7%
279	264	957	26.8%	97.3%
278	515	968	52.3%	98.4%
277	657	970	66.8%	98.6%
276	759	970	77.1%	98.6%
275	944	975	95.9%	99.1%
274	982	981	99.8%	99.7%
273	984	984	100.0%	100.0%
272	984	984	100.0%	100.0%
271	984	984	100.0%	100.0%
270	984	984	100.0%	100.0%
Total Months	984	984		

Note: Based on 1-FT contour interval.

TABLE 4 - U/L CRYSTAL SPRINGS WATER SURFACE ELEVATIONS

Matrix Data for Water Year 1921-2002 Rank Ordered by Descending 5 RESERVOIR INDEX (Aggregated Annual Inflow to 5 Bay Area Reservoirs)

Crystal Springs Reservoir Water Surface Elevation (FT, NGVD-29)

Baseline Condition (2005)

Yr Type	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
W	1983	278	278	278	284	284	284	284	284	277	275	275	276
W	1998	277	276	278	284	288	284	284	284	281	278	276	276
W	1958	278	277	278	278	283	283	284	283	279	276	274	277
W	1941	278	276	278	280	284	283	284	283	278	276	275	276
W	1982	278	278	278	284	284	280	284	283	278	275	275	277
W	1995	278	278	278	284	283	284	283	283	281	277	275	278
W	1956	277	275	284	284	284	279	283	283	281	278	276	278
W	1952	277	276	278	284	284	283	283	283	281	278	276	278
W	1938	278	276	278	278	284	284	284	283	279	276	274	277
W	1997	278	278	284	284	282	279	281	279	277	275	275	276
W	1969	278	276	278	284	284	280	282	283	280	277	275	277
W	1973	277	278	278	281	284	281	283	283	281	277	275	278
W	1986	277	275	276	278	284	284	284	282	278	275	275	277
W	1980	278	277	277	284	284	279	283	283	281	277	275	278
W	1942	278	276	278	284	284	279	283	283	278	275	275	276
W	1967	277	276	278	281	281	279	282	284	278	275	275	276
AN	1963	277	275	277	283	284	279	284	284	278	275	275	276
AN	1940	277	275	276	278	284	282	283	282	278	275	275	277
AN	1965	277	276	278	284	282	279	282	283	280	277	275	277
AN	1996	278	276	276	282	284	281	283	282	278	275	274	277
AN	1922	277	275	278	278	284	281	283	282	278	275	275	277
AN	1975	278	277	278	278	284	284	284	283	279	276	274	277
AN	1974	277	276	279	284	281	278	284	283	279	276	274	277
AN	1978	274	276	276	284	284	283	284	283	278	275	275	276
AN	1993	275	277	278	284	284	282	284	283	278	275	275	276
AN	1951	277	278	282	284	283	278	282	283	281	277	275	278
AN	1943	277	277	278	284	284	279	282	283	280	277	275	277
AN	1927	278	278	277	278	283	278	283	283	281	277	275	278
AN	1937	278	276	277	277	278	279	283	282	278	275	275	277
AN	2000	278	276	277	277	282	278	282	282	279	276	274	277
AN	1921	278	277	278	283	283	278	280	279	276	275	275	275
AN	1999	276	275	277	278	281	278	281	283	281	277	276	278
AN	1923	278	277	278	281	279	275	278	277	275	275	275	277
N	1953	278	276	278	283	281	278	279	279	276	275	275	276
N	1928	277	275	276	277	277	278	284	284	281	278	275	277
N	1970	277	275	278	284	281	278	281	281	278	275	274	277
N	1984	278	278	283	283	278	276	278	277	274	275	275	275
N	1946	278	277	279	282	279	277	278	278	275	275	275	275
N	1926	276	275	275	278	284	279	282	281	278	275	274	277
N	1936	278	277	278	278	282	278	281	281	278	275	274	277
N	1945	278	277	278	278	280	278	281	281	278	275	274	277
N	1971	278	278	279	281	278	275	277	276	275	275	275	275
N	1935	278	278	278	280	278	277	283	282	277	275	275	276
N	1932	278	278	282	284	284	279	282	282	281	278	275	276
N	1979	278	277	278	278	280	278	282	281	278	275	274	277
N	1962	278	278	277	277	283	281	283	283	281	277	275	278
N	1949	278	277	278	278	278	278	282	283	281	277	275	277
N	1992	278	277	277	277	284	281	282	282	281	281	281	278
N	1981	277	275	277	278	276	277	278	277	275	275	275	275
BN	2001	278	277	278	278	278	277	278	278	275	275	274	277
BN	1930	277	275	276	278	278	279	281	279	277	275	275	276
BN	1954	278	277	278	278	278	278	280	279	276	275	275	276
BN	1968	278	277	278	278	277	276	277	276	275	275	275	276
BN	1959	278	277	278	278	279	275	277	276	275	275	275	275
BN	1925	278	278	278	278	278	277	282	284	281	278	275	276
BN	1944	277	275	277	276	278	276	277	276	275	275	275	276
BN	2002	278	277	278	278	275	274	276	275	275	275	275	275
BN	1950	277	275	276	278	278	276	278	277	275	275	275	275
BN	1966	277	277	278	278	278	275	276	275	275	275	275	275
BN	1955	278	277	278	278	275	273	274	274	275	275	275	275
BN	1957	278	276	277	277	278	275	277	276	275	275	275	276
BN	1934	277	275	278	278	278	276	277	276	275	274	274	278
BN	1985	278	278	278	277	278	276	278	277	275	275	275	275
BN	1991	275	276	276	276	275	279	283	282	280	283	281	278
BN	1929	277	275	276	277	277	275	277	276	275	275	275	275
BN	1964	278	278	278	278	276	274	275	274	275	275	275	275
D	1947	278	278	278	278	278	275	276	276	275	275	275	275
D	1994	278	277	278	278	278	276	277	276	275	274	274	278
D	1939	278	277	278	277	277	275	277	276	275	275	275	275
D	1948	277	275	277	278	278	277	279	278	275	275	275	276
D	1960	277	275	276	278	278	275	276	275	275	274	274	278
D	1972	277	276	278	278	278	274	276	274	275	275	275	275
D	1933	278	276	277	277	275	273	274	274	275	275	275	275
D	1961	278	278	278	278	277	276	280	282	281	283	281	279
D	1990	274	276	276	276	276	276	282	284	284	283	281	278
D	1987	278	276	277	278	278	276	277	276	275	274	274	278
D	1988	278	278	278	278	276	274	278	279	279	281	281	278
D	1989	278	278	278	278	276	277	283	284	284	283	281	278
D	1931	278	277	277	278	278	275	276	275	275	277	279	278
D	1976	278	277	278	278	278	275	276	275	275	274	274	278
D	1977	278	278	278	278	278	276	279	281	281	283	281	278
D	1924	278	277	277	278	278	275	275	274	275	274	274	278

TABLE 4 - U/L CRYSTAL SPRINGS WATER SURFACE ELEVATIONS

Matrix Data for Water Year 1921-2002 Rank Ordered by Descending 5 RESERVOIR INDEX (Aggregated Annual Inflow to 5 Bay Area Reservoirs)

Crystal Springs Reservoir Water Surface Elevation (FT, NGVD-29)

LCSDI Project

Yr Type	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
W	1983	283	283	283	288	288	288	288	288	284	283	282	285
W	1998	283	282	281	288	288	285	288	288	286	284	283	284
W	1958	283	283	281	283	288	288	288	288	285	284	283	285
W	1941	283	283	283	287	288	287	288	288	285	283	282	285
W	1982	283	283	283	288	288	285	288	288	285	284	283	285
W	1995	283	278	275	284	283	288	288	287	285	283	282	284
W	1956	283	283	288	288	288	285	288	288	286	284	283	284
W	1952	283	283	283	288	288	287	288	288	286	284	284	284
W	1938	283	283	283	283	288	288	288	288	286	284	284	284
W	1997	283	283	288	288	286	285	287	288	286	285	283	284
W	1969	283	283	283	288	288	285	287	288	286	285	284	284
W	1973	283	283	282	288	288	286	288	288	286	284	284	284
W	1986	283	283	281	283	288	288	288	288	286	284	284	284
W	1980	282	277	273	283	288	285	288	288	286	285	284	284
W	1942	283	283	283	288	288	285	288	288	285	284	283	285
W	1967	283	283	283	288	287	285	288	288	284	283	282	285
AN	1963	282	282	279	283	287	285	288	288	285	283	281	284
AN	1940	283	278	274	283	286	285	288	288	286	284	283	284
AN	1965	283	278	282	286	283	285	288	288	286	284	284	284
AN	1996	283	283	281	285	288	285	288	288	286	284	283	284
AN	1922	283	283	283	283	288	285	287	288	286	284	284	284
AN	1975	283	279	274	283	286	286	288	288	286	284	284	284
AN	1974	283	283	286	288	283	285	288	288	286	284	284	284
AN	1978	283	283	281	285	288	287	288	288	287	285	283	284
AN	1993	283	283	282	288	288	287	288	288	286	284	282	283
AN	1951	283	283	287	288	287	285	288	288	286	284	284	284
AN	1943	283	283	281	288	288	285	288	288	286	284	284	284
AN	1927	283	283	283	283	288	285	288	288	286	285	284	284
AN	1937	283	283	283	282	285	286	288	288	286	284	283	284
AN	2000	283	279	273	282	283	285	288	288	286	284	282	284
AN	1921	283	283	283	287	287	285	287	288	286	285	284	284
AN	1999	283	283	283	283	285	285	288	288	286	284	283	284
AN	1923	283	282	285	287	287	286	288	288	286	285	284	284
N	1953	283	283	284	288	286	285	288	288	286	284	284	284
N	1928	283	283	282	283	283	285	288	288	286	285	284	284
N	1970	283	278	274	283	283	285	288	288	286	285	284	284
N	1984	283	283	288	288	283	285	288	288	287	286	285	285
N	1946	283	282	285	287	285	285	288	288	286	285	284	284
N	1926	283	283	281	283	285	285	288	288	286	285	284	284
N	1936	283	283	280	283	285	285	288	288	286	284	284	284
N	1945	283	278	274	283	283	285	288	288	287	286	285	285
N	1971	283	282	285	286	282	285	288	288	287	286	285	285
N	1935	283	279	275	283	283	285	288	288	286	284	282	284
N	1932	283	283	283	283	285	286	288	288	286	285	283	284
N	1979	283	282	282	283	284	284	288	288	286	285	283	284
N	1962	283	283	283	283	283	285	288	288	286	285	283	284
N	1949	283	282	283	283	281	285	288	288	286	284	283	283
N	1992	283	283	283	283	283	285	288	288	286	287	286	285
N	1981	283	283	281	283	281	285	288	288	286	285	284	284
BN	2001	282	283	281	282	283	286	288	288	286	285	284	284
BN	1930	283	278	274	283	283	285	288	288	287	286	285	285
BN	1954	283	283	283	283	283	285	288	288	286	285	284	284
BN	1968	283	283	281	283	282	285	288	288	287	286	285	285
BN	1959	283	283	283	283	284	285	288	288	286	285	284	284
BN	1925	283	278	275	283	283	285	288	288	287	286	284	285
BN	1944	283	283	282	283	283	285	288	288	286	285	284	284
BN	2002	283	283	283	283	282	285	288	288	287	286	285	285
BN	1950	283	278	273	283	283	284	287	287	286	285	284	285
BN	1966	283	283	283	283	283	285	287	288	287	286	285	285
BN	1955	283	278	275	283	283	285	288	288	287	286	286	285
BN	1957	282	282	282	282	283	285	287	288	286	285	284	285
BN	1934	283	283	283	283	283	285	287	288	287	286	286	285
BN	1985	283	280	275	283	283	285	288	288	287	286	285	285
BN	1991	283	283	281	282	282	285	288	288	287	286	286	285
BN	1929	283	283	283	283	282	284	287	288	287	286	285	285
BN	1964	283	283	283	283	281	282	285	285	284	282	281	284
D	1947	283	282	282	283	282	284	287	288	287	286	285	284
D	1994	283	283	283	283	283	284	287	287	286	285	285	285
D	1939	283	283	283	282	281	283	286	287	286	285	284	285
D	1948	283	282	280	282	283	285	288	288	287	286	286	285
D	1960	283	278	274	282	283	285	287	288	287	286	286	285
D	1972	283	283	283	283	282	283	286	287	286	284	283	285
D	1933	283	282	279	282	282	283	286	286	285	283	282	285
D	1961	283	283	281	283	283	285	288	288	287	287	286	285
D	1990	283	278	277	283	283	285	288	288	288	287	286	285
D	1987	283	283	283	282	281	283	285	286	285	285	284	285
D	1988	283	282	280	282	281	283	286	288	287	288	286	285
D	1989	283	283	283	283	281	285	288	288	287	287	286	285
D	1931	283	283	281	283	283	285	287	288	287	288	286	285
D	1976	283	283	281	283	283	285	287	288	287	286	286	285
D	1977	283	283	283	283	281	283	286	287	287	288	286	285
D	1924	283	283	283	283	282	283	286	287	286	285	285	285

TABLE 4 - U/L CRYSTAL SPRINGS WATER SURFACE ELEVATIONS

Matrix Data for Water Year 1921-2002 Rank Ordered by Descending 5 RESERVOIR INDEX (Aggregated Annual Inflow to 5 Bay Area Reservoirs)

Crystal Springs Reservoir Water Surface Elevation (FT, NGVD-29)

LCSDI Project minus
Baseline Condition (2005)

Yr Type	Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
W	1983	5	5	5	4	4	4	4	4	7	8	7	9
W	1998	6	6	3	4	0	1	4	4	5	6	7	8
W	1958	5	6	3	5	5	5	4	5	6	8	9	8
W	1941	5	7	5	7	4	4	4	4	7	7	7	9
W	1982	5	5	5	4	4	5	4	5	7	9	8	8
W	1995	5	0	-3	0	0	4	5	4	5	6	7	6
W	1956	6	8	4	4	4	6	5	5	5	6	7	6
W	1952	6	7	5	4	4	4	5	5	5	6	8	6
W	1938	5	7	5	5	4	4	4	5	7	8	10	7
W	1997	5	5	4	4	4	6	7	9	9	10	8	8
W	1969	5	7	5	4	4	5	5	5	6	8	9	7
W	1973	6	5	4	7	4	4	5	5	5	7	9	6
W	1986	6	8	5	5	4	4	4	6	8	9	9	7
W	1980	4	0	-4	-1	4	6	5	5	5	8	9	6
W	1942	5	7	5	4	4	6	5	4	7	9	8	9
W	1967	6	7	5	7	6	6	6	4	6	8	7	9
AN	1963	5	7	2	1	3	6	4	4	7	8	6	8
AN	1940	6	3	-2	5	2	3	5	6	8	9	8	7
AN	1965	6	2	4	2	1	6	6	5	5	7	9	7
AN	1996	5	7	5	4	4	4	5	6	8	9	9	7
AN	1922	6	8	5	5	4	4	4	6	8	9	9	7
AN	1975	5	2	-4	5	2	2	4	5	7	8	10	7
AN	1974	6	7	7	4	3	7	4	5	7	8	10	7
AN	1978	9	7	5	1	4	4	4	5	9	10	8	8
AN	1993	8	6	4	4	4	5	4	4	8	9	7	7
AN	1951	6	5	6	4	5	7	5	5	5	7	9	6
AN	1943	6	6	3	4	4	6	6	5	5	7	9	7
AN	1927	5	5	6	5	5	7	4	5	5	8	9	6
AN	1937	5	7	6	5	7	7	5	6	8	9	8	7
AN	2000	5	3	-4	5	1	7	6	6	7	8	8	7
AN	1921	5	6	5	4	3	7	7	9	10	10	9	9
AN	1999	7	8	6	5	4	7	7	5	5	7	7	6
AN	1923	5	5	7	7	8	11	10	11	11	10	9	7
N	1953	5	7	6	4	5	7	9	9	10	9	9	8
N	1928	6	8	6	6	6	7	4	4	5	7	9	7
N	1970	6	3	-4	-1	1	7	7	7	8	10	10	7
N	1984	5	5	4	5	5	9	10	11	13	11	10	10
N	1946	5	5	6	5	6	8	10	10	11	10	9	9
N	1926	7	8	6	5	1	6	6	7	8	10	10	7
N	1936	5	6	2	5	3	7	7	7	8	9	10	7
N	1945	5	1	-4	5	3	7	7	7	9	11	11	8
N	1971	5	4	6	6	4	10	11	12	12	11	10	10
N	1935	5	1	-3	3	5	8	5	6	9	9	7	8
N	1932	5	5	2	-1	1	7	6	6	6	7	8	8
N	1979	5	5	4	5	4	6	6	7	8	10	9	7
N	1962	5	5	6	6	0	4	5	5	6	8	8	6
N	1949	5	5	5	5	3	7	6	5	5	7	8	6
N	1992	5	6	6	6	-1	4	5	5	5	6	5	7
N	1981	6	8	4	5	5	8	10	11	11	10	9	9
BN	2001	4	6	3	4	5	9	10	10	11	10	10	7
BN	1930	6	3	-2	5	5	6	7	9	10	11	10	9
BN	1954	5	6	5	5	5	7	8	9	10	10	9	8
BN	1968	5	6	3	5	5	9	11	12	12	11	10	9
BN	1959	5	6	5	5	5	10	11	12	11	10	9	9
BN	1925	5	0	-3	5	5	8	6	4	6	8	9	9
BN	1944	6	8	5	7	5	9	11	12	11	10	9	8
BN	2002	5	6	5	5	7	11	12	13	12	11	10	10
BN	1950	6	3	-3	5	5	8	9	10	11	10	9	10
BN	1966	6	6	5	5	5	10	11	13	12	11	10	10
BN	1955	5	1	-3	5	8	12	14	14	12	11	11	10
BN	1957	4	6	5	5	5	10	10	12	11	10	9	9
BN	1934	6	8	5	5	5	9	10	12	12	12	12	7
BN	1985	5	2	-3	6	5	9	10	11	12	11	10	10
BN	1991	8	7	5	6	7	6	5	6	6	4	5	7
BN	1929	6	8	7	6	5	9	10	12	12	11	10	10
BN	1964	5	5	5	5	5	8	10	11	9	7	6	9
D	1947	5	4	4	5	4	9	11	12	12	11	10	9
D	1994	5	6	5	5	5	8	10	11	11	11	11	7
D	1939	5	6	5	5	4	8	9	11	11	10	9	10
D	1948	6	7	3	4	5	8	9	10	12	11	11	9
D	1960	6	3	-2	4	5	10	11	13	12	12	12	7
D	1972	6	7	5	5	4	9	10	13	11	9	8	10
D	1933	5	6	2	5	7	10	12	12	10	8	7	10
D	1961	5	5	3	5	6	9	8	6	6	4	5	6
D	1990	9	2	1	7	7	9	6	4	4	4	5	7
D	1987	5	7	6	4	3	7	8	10	10	11	10	7
D	1988	5	4	2	4	5	9	8	9	8	7	5	7
D	1989	5	5	5	5	5	8	5	4	4	3	5	7
D	1931	5	6	4	5	5	10	11	13	12	11	7	7
D	1976	5	6	3	5	5	10	11	13	12	12	12	7
D	1977	5	5	5	5	3	7	7	7	6	5	5	7
D	1924	5	6	6	5	4	8	11	13	11	11	11	7